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THE INSTITUTE OF PETROLEUM REVIEW

V.13 #148

April 1959

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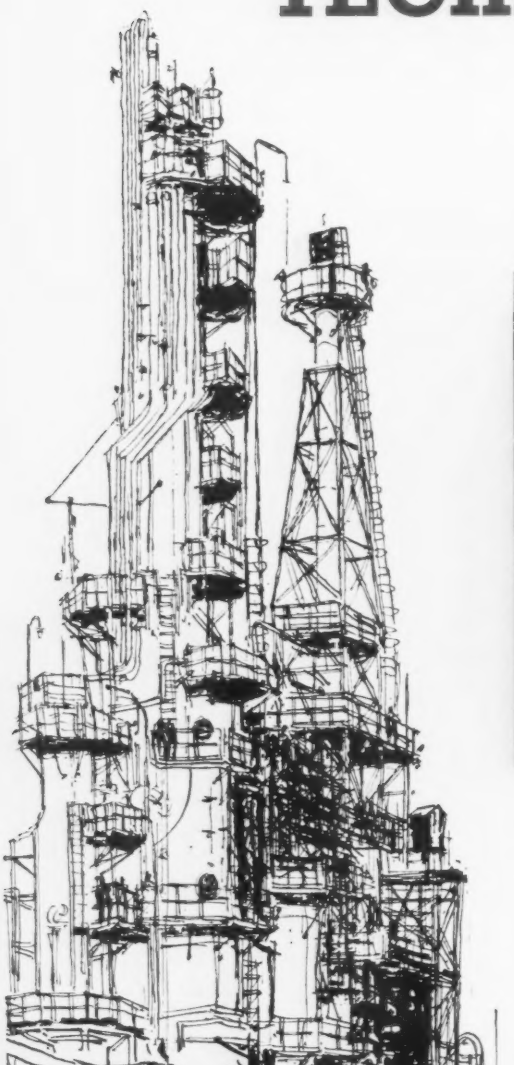

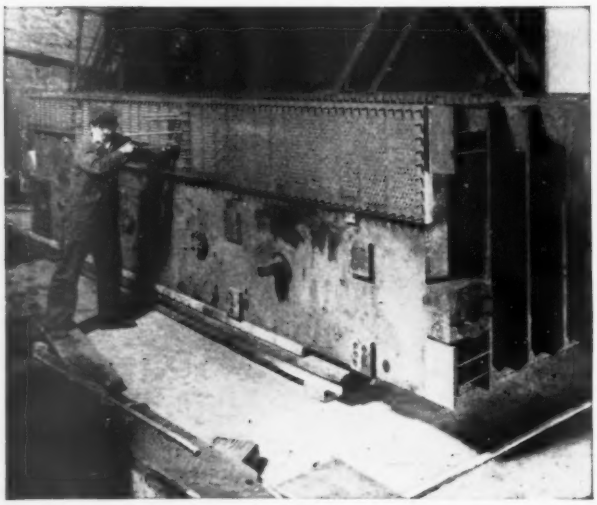

A 50,000 gal. day evaporator for a refinery under construction by Procon (Great Britain) for Anglo Ecuadorian Oilfields, Ltd., being tubed with SERCKALBRA.
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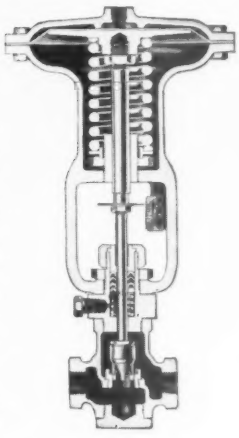

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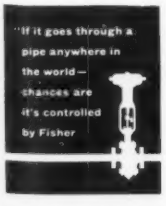

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61 New Cavendish Street, London, W.1
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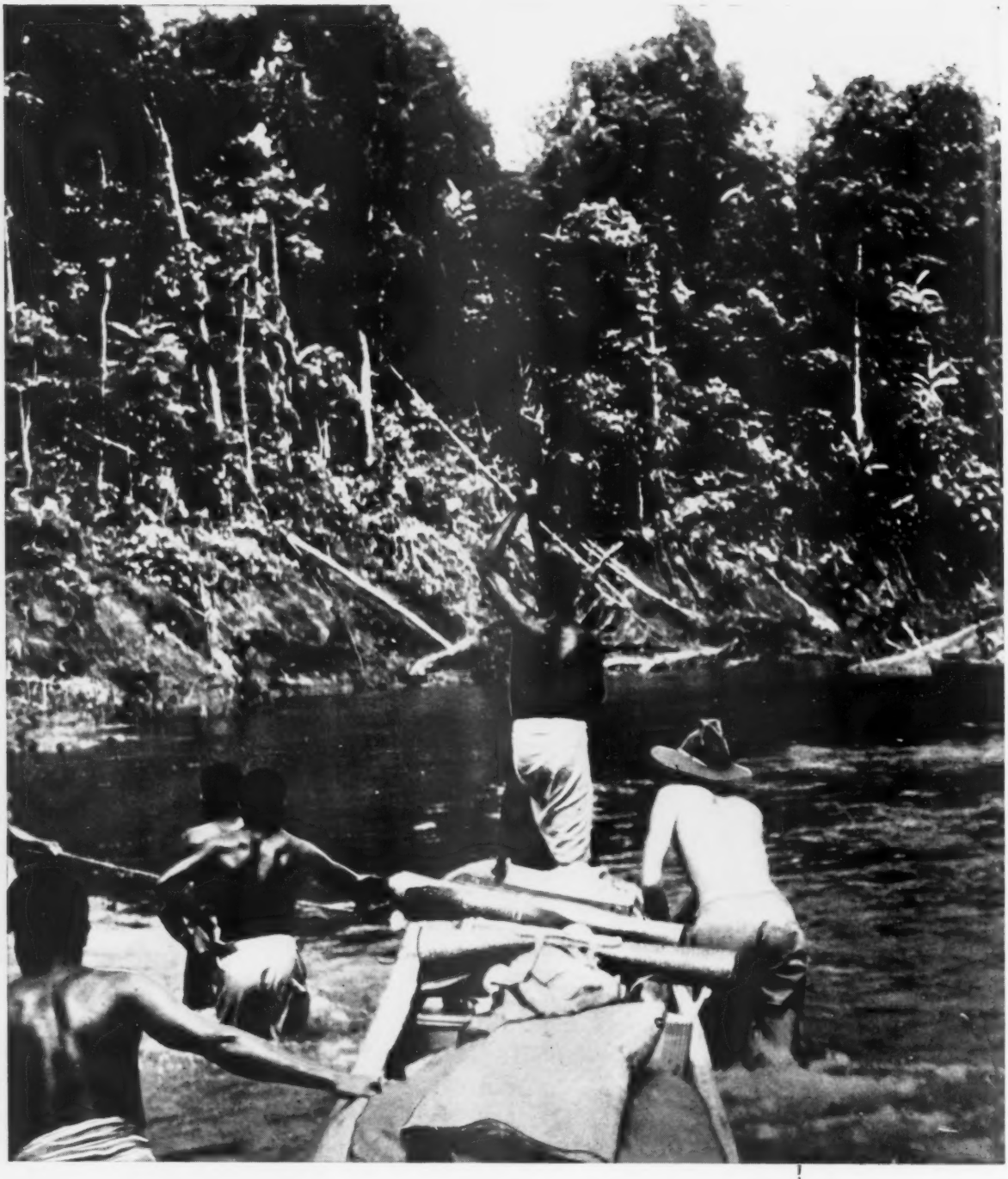

Papua. A route to a new drilling site is prepared. The British Petroleum Company's search for oil is a world-wide operation.

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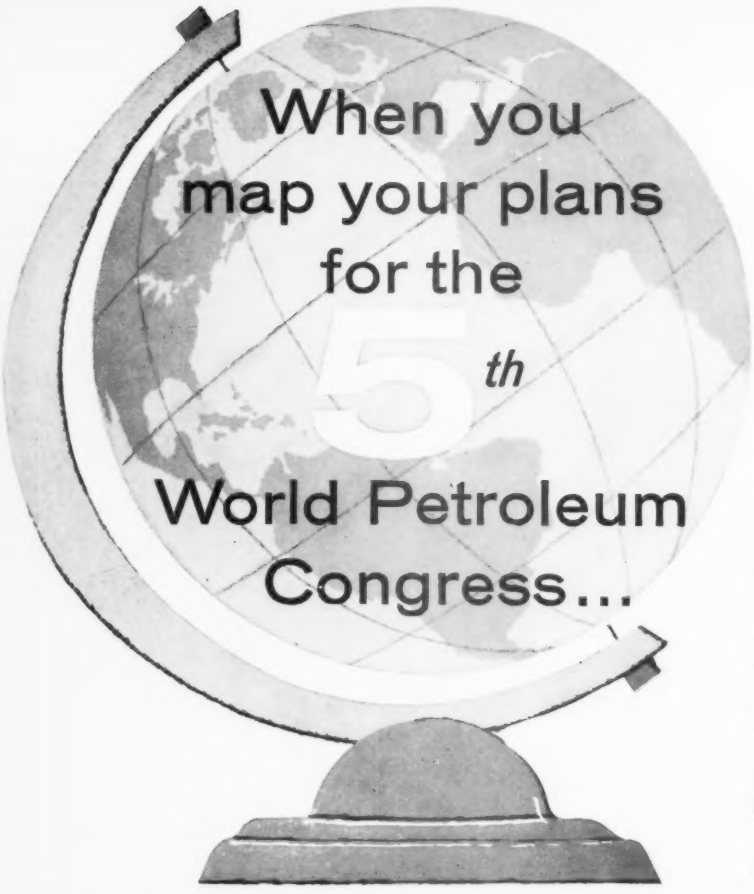

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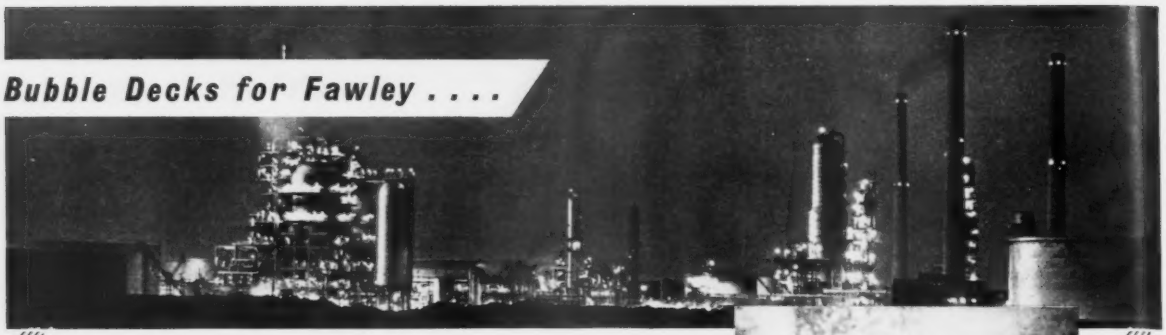

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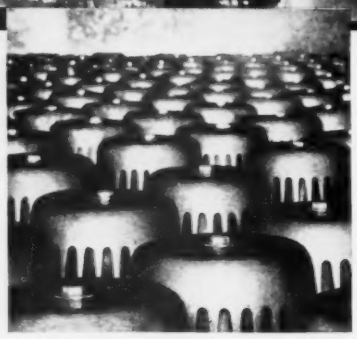

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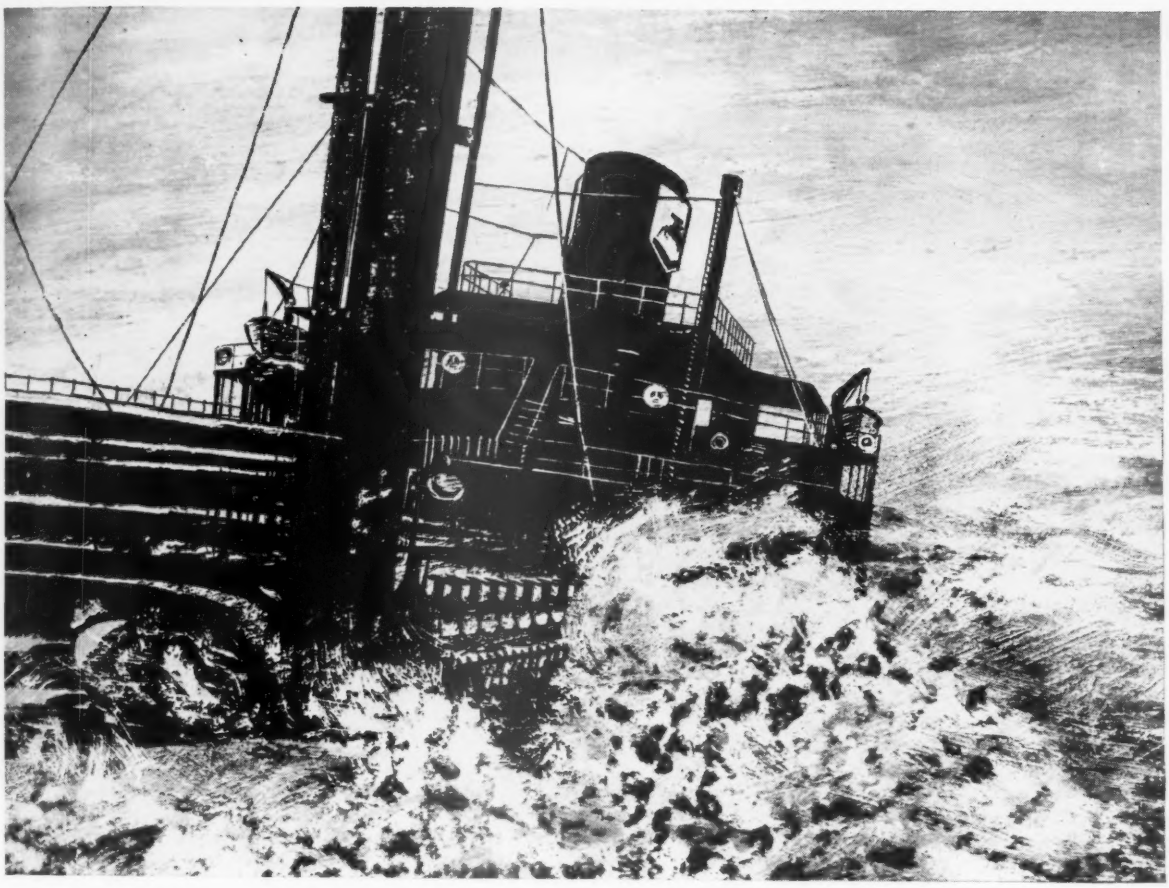
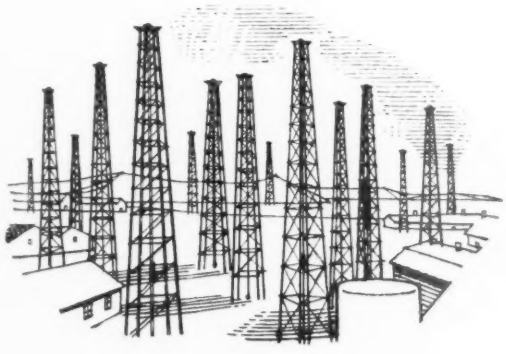


Bringing it home



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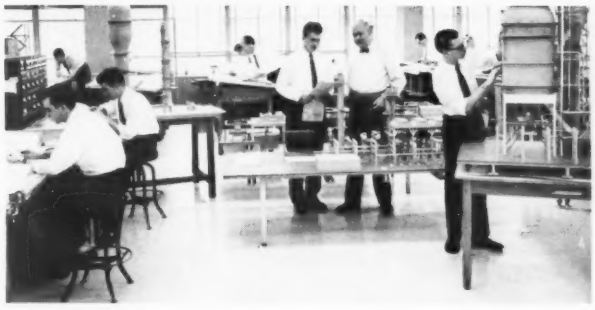

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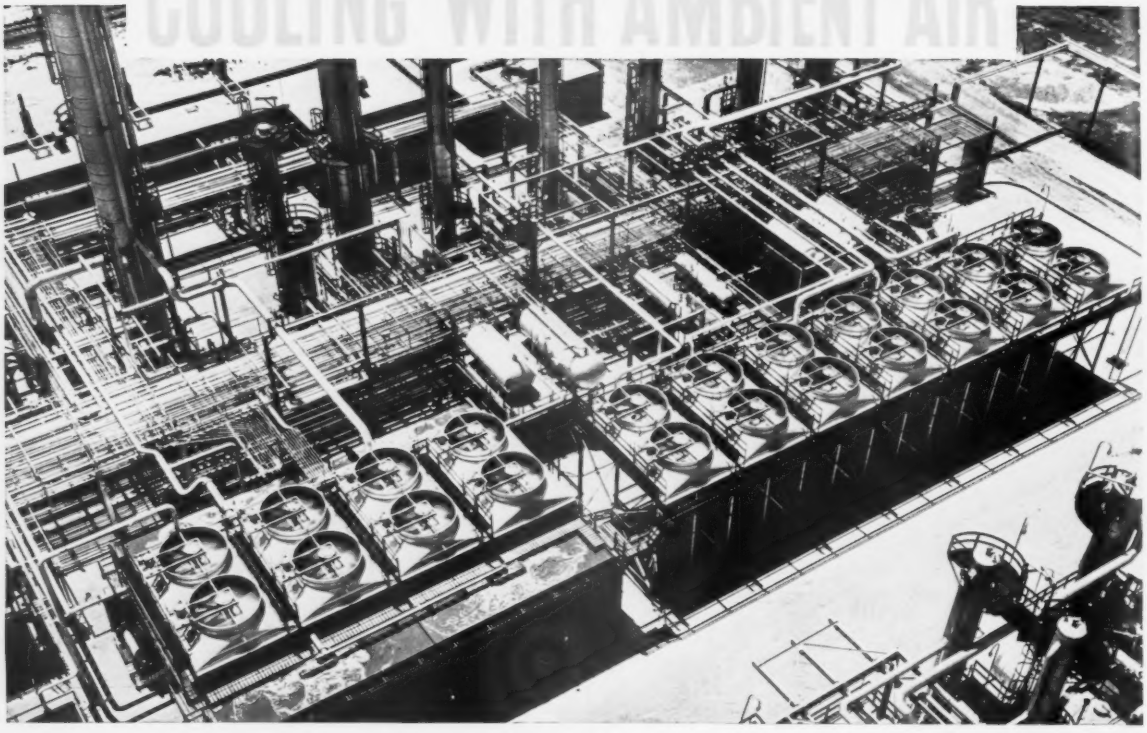

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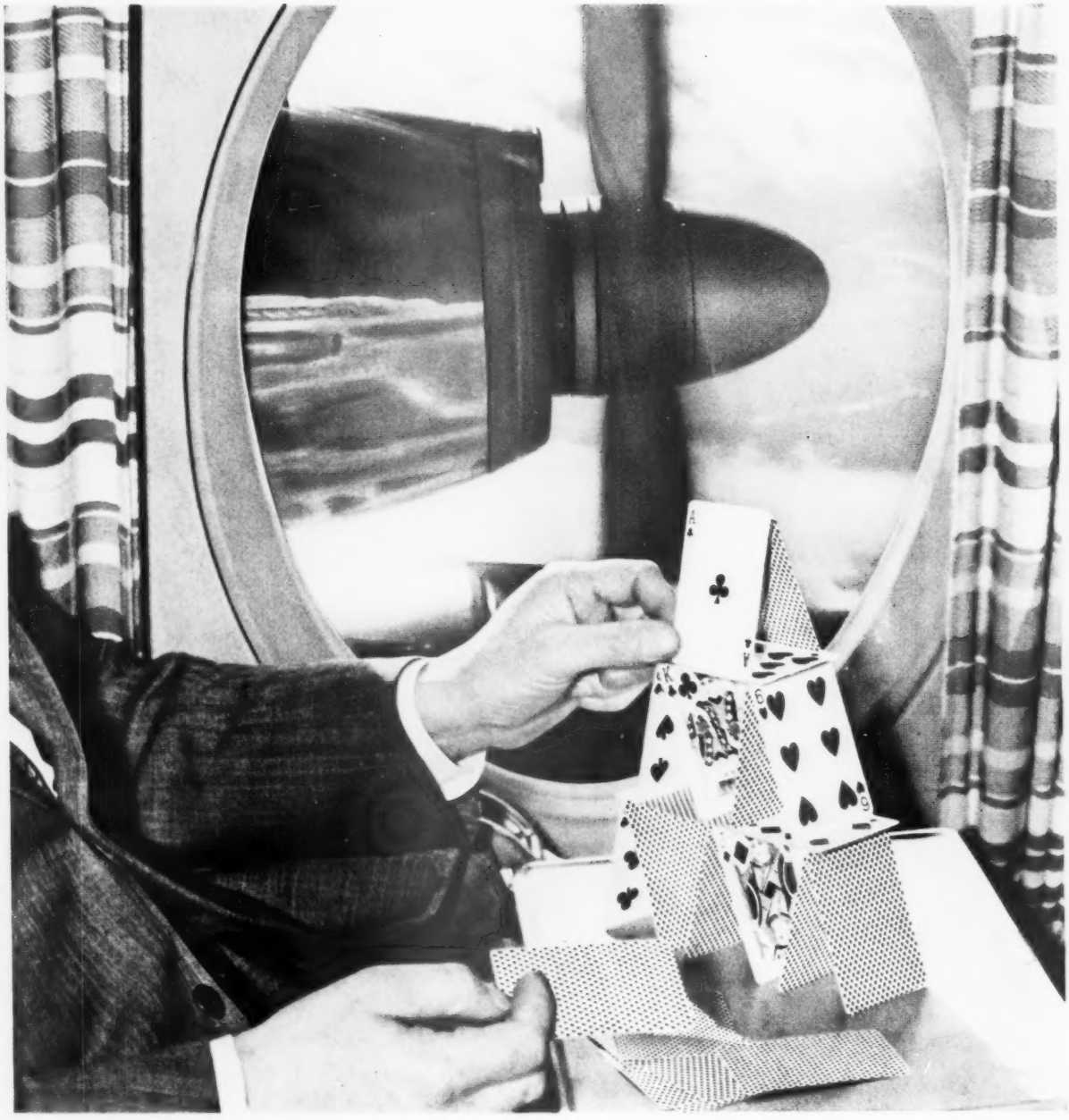

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THE INSTITUTE OF PETROLEUM

REVIEW

Volume 13, No. 148 April 1959

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The Annual Dinner

Once again the attendance at the Annual Dinner of the Institute reached a total of over fourteen hundred members and guests. For this year's event, on 18 February, the Great Hall of Grosvenor House was, as usual, the venue.

The dinner was presided over by the president, C. M. Vignoles, C.B.E., the guests of honour being The Right Honourable Lord Mills, K.B.E., the Minister of Power, and The Right Honourable Lord Monckton of Brenchley, P.C., K.C.M.G., K.C.V.O., M.C., *chairman, Iraq Petroleum Co. Ltd.*

Official guests included: Sir Reginald Ayres, K.B.E., C.B., *deputy secretary, Ministry of Power;* T. C. Bailey, *president, Institute of Fuel;* L. E. G. Brouwer, *managing director, Shell Petroleum Co. Ltd;* J. H. Buscombe, *director, Shell-Mex and B.P. Ltd;* Rear-Admiral N. A. Copeman, D.F.C., *The Fourth Sea Lord;* Air Chief Marshal Sir Walter Dawson, K.C.B., C.B.E., D.S.O., *Air Member for Supply and Organization, The Air Ministry;* Sir Archibald Forbes, Kt., *chairman, The Iron and Steel Board;* Rear-Admiral Sir Sidney Frew, K.B.E., C.B.; J. C. Gridley, C.B.E., *chairman, Mobil Oil Co. Ltd;* A. A. Jarrett, *private secretary to the Minister of Power;* Sir Gilmour Jenkins, K.C.B., K.B.E., M.C., *permanent secretary, The Ministry of Transport and Civil Aviation;* Air Marshal Sir R. Owen Jones, K.B.E., C.B., A.F.C., *president, The Institution of Mechanical Engineers;* A. B. Lawrence, Jr, *managing director, Caltex Services Ltd;* Major-General L. O. Lyne, C.B., D.S.O., *deputy chairman, Manchester Oil Refinery (Holdings) Ltd;* E. G. C. Mardell, *general manager, Lobitos Oilfields Ltd;* E. L. McGinnis, *Petroleum Attaché, The United States Embassy;* J. M. Pattinson, C.B.E., *managing director, The British Petroleum Co. Ltd;* R. J. Pinder, C.B.E., *managing director, Esso Petroleum Co. Ltd;* H. W. Rocke, *managing director, Mobil Oil Co. Ltd;* T. A. Rogers, C.B.E., *president, The Institution of Marine Engineers;* R. D. Ropner, *president, The Chamber of Shipping;* Major-General G. N. Russell, C.B., C.B.E., *president, Institute of Transport;* R. P. Smith, *managing director, Burmah Oil Co. Ltd;* H. E. Snow, C.B.E., *managing director, The British Petroleum Co. Ltd;* K. L. Stock, C.B., *Under-Secretary, Ministry of Power;* C. J. Stubblefield, *president, The Geological Society;* G. H. Thorne, *chairman, Council of British Manufacturers of Petroleum Equipment;* Sir Owen Wansbrough-Jones, K.B.E., C.B., *chief scientist, Ministry of Supply;* H. Wilkinson, C.M.G., *managing director, The Shell Petroleum Co. Ltd;* D. A. H. Wright, C.M.G., *Permanent Under-Secretary of State, Foreign Office.*

The Members of Council of the Institute present were: The Right Honourable Lord Geddes, C.B.E., D.L. (*immediate past-president*); W. S. Ault, E. LeQ. Herbert, H. Hyams, Prof. F. Morton, J. S. Parker, R. B. Southall, C.B.E. (*vice-presidents*); V. Biske, W. M. Catchpole, Dr E. B. Evans, F. L. Garton, Sir Stephen Gibson, C.B.E., A. J. Goodfellow, A. C. Hartley, C.B.E., M. E. Hubbard, E. C. Masterson, T. W. Mathias, O.B.E., J. R. Moore, Dr K. E. W. Ridler, D. L. Samuel, E. J. Sturgess, C.B.E., W. H. Thomas, G. H. Thornley, D. H. Tullis, A. T. Wilford, Dr C. G. Williams, C. S. Windebank, J. C. Wood-Mallock (*members of Council*); C. Chilvers (*honorary secretary*); and G. H. Coxon (*honorary treasurer*).

The President (right) *greets Lord Mills*

THE INDUSTRY AND THE INSTITUTE

Lord Mills, K.B.E., Minister of Power, proposing the toast "The Institute of Petroleum and the Petroleum Industry", said:

I stand before you as the Minister of Power, whereas my predecessors in office enjoyed the fuller sounding title of Minister of Fuel and Power. It was said of some of them that they had too much power and too little fuel. Now all that is changed. We have plentiful supplies of fuel, and I am twitted with not

having enough power to deal with one industry for the benefit of another.

However, my task as defined by Act of Parliament is to secure the effective and co-ordinated development of coal, petroleum, and other sources of fuel and power in Great Britain, and to promote economy and efficiency in their supply; and I do not think I shall be giving away any State secrets when I tell you that my colleagues and I believe that competition is necessary both for economy and for efficiency.

The Annual Dinners of the Institute of Petroleum are always great social and business occasions. But to-night's may be specially significant. The historical claim has been made that the first well was drilled for oil in 1859 and on that reckoning this must be the oil industry's centenary year. What youthful centenarians you are, and what a record of achievement! Men have gone into the remote corners of the world, like the deserts of Arabia, the Sahara Desert—and Texas—and Alaska—to win the oil and bring it to the betterment of man. The industry has excelled in technical achievement and business enterprise. As a layman, I should be in need of platforming, hydroforming, and reforming, to say nothing of cracking, if I sought to do justice to the great achievements of your industry, to the engineering and scientific developments brought about by petroleum technologists over the years. And in this your Institute has played and is playing an important part in these developments by fostering research, education, and training, by promoting standardization of specification, by providing a clearing house for the exchange of knowledge and ideas, and perhaps more than anything else by seeking to harmonize the interests of the different sections of the industry—research, geology, production, refining, transport and marketing—and of the various professions and skills.

The Institute—particularly its Economics and Operations Group—is concerned with the problems of trade and commerce as much as with those of science and engineering. Indeed, the trading activities of the oil industry are prodigious. Oil is the largest item that enters into international trade. The international oil industry, with its oilfields scattered over the globe, with its vast tanker fleets and its refineries and installations in most of the world's large trading centres, represents a great international trading community. Oil men are usually thought of as being rugged individuals well able to adapt themselves rapidly to changing circumstances however adverse, and flexible outlooks have gone hand in hand with flexible methods of organization and operation. This resilience on the part of the oil industry stood us in good stead when, because of events in Persia, we had to make do without the oil from Abadan, and more recently during the Suez emergency.

International Oil Trade

The oil man's parish is wide. This Institute, for example, has branches in many far corners, including Bahrain, Trinidad, Kuwait, Birmingham, and South Wales. The oil industry is accustomed to view matters in the perspective not of one consuming country, but of the world. I should like, nevertheless, to speak for a moment of the impact of the oil trade on Britain. You are the largest single unit that I know of in international trade. For we live by international trade and it is not surprising to find that at many points the interests of the United Kingdom and of the international oil industry coincide.

British companies play an important part in this international oil trade. The bulk of the oil which they produce overseas does not come to this country at all, but is sold in turn to customers overseas, and this gives us an important invisible export. The companies' contribution to our balance of payments helps to keep the pound sterling strong. Undoubtedly they played a part in making possible the recent move to full convertibility of overseas sterling.

Other British industries have benefited indirectly by the success of oil as they always do from any expansion of world trade. Since the war we have built up what is virtually a new industry for producing specialized petroleum equipment, and its export orders are now in the neighbourhood of £100 million a year.

And again, the growth of the tanker fleets of the world, many of them under the British flag, has helped to swell the invisible earnings of our shipping and to provide orders and employment for British shipyards.

Finally, there is the modern refining industry that has sprung up on our coasts and estuaries. Before the war we imported most of our petroleum as finished products. Oil refining was only on a small scale. Since the war old refineries have been greatly expanded and new ones have been built. To-day most of the oil to supply our own needs comes from home refineries and there is an export trade worth about £100 million a year. These visible exports add to the much larger invisible exports I have mentioned.

The refineries not only produce fuels but they give us the raw materials for the fast growing industry of petrochemicals; things like nylons, fibres made by man for the use of woman, plastics like the polythene bucket one may silently kick, long-life tyres, and even synthetic alcohol! It started in 1859 with an oil well; to-day the world in general is well oiled!

I do, however, wish to say in all seriousness that as Minister of Power I have every reason to be grateful for the co-operation I have received from the industry. I recall, Sir, the work of the Oil Industry Committee under your chairmanship, which worked with us closely at the time of the Suez emergency, and there have been many other instances, some earlier, some later, where the industry has willingly assisted the Government, putting general interest first. This is, I know, part of a long tradition which has been established over many years through peace and war.

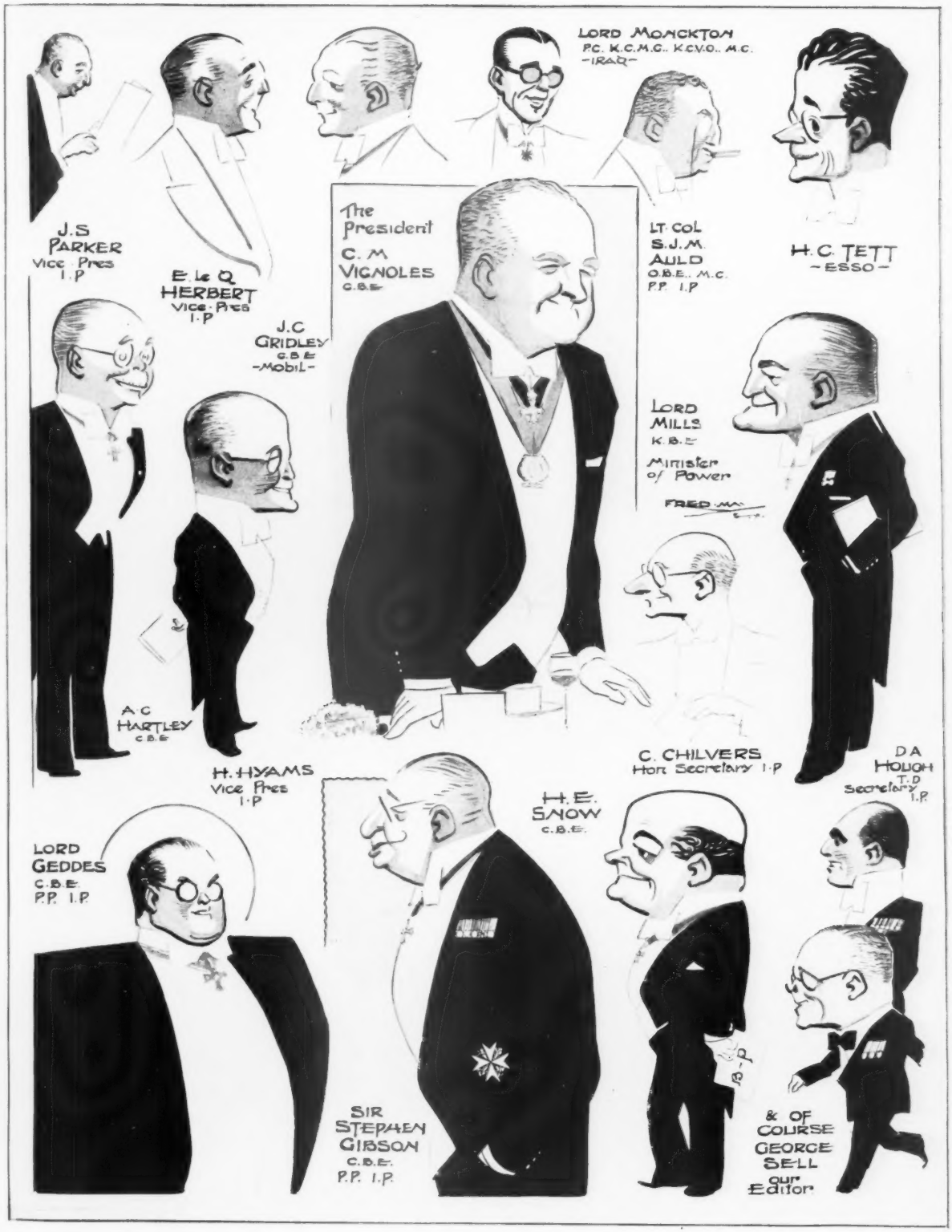
The President Replies

The toast was received with acclamation and C. M. Vignoles, C.B.E., president of the Institute, replying to the toast, said:

We are particularly grateful to Lord Mills for sparing the time to be with us to-night.

Many of us, and particularly my colleagues in the enterprise which I serve, have known him for many years, and we have learned to look upon him as our friend. We continue to look upon him in that way, and realize that in his new capacity he is still our friend, and always ready to help us in every way.

The Institute of Petroleum which welcomes you all here to-night is not, as you are aware, a trade association, a form of activity which is going down in the social scale, but an assembly of individuals and corporate members, who by their efforts, and by the mutual exchange of ideas and knowledge and experience, are trying to improve the skills and techniques of the business in which we all work. Our chief guest of honour last year said that the principal task of the Institute was to see that people in the petroleum


LORD MONCKTON
P.C. K.C.M.G., K.C.V.O., M.C.
-IRAQ-
J.S PARKER
Vice Pres
I.P
E le Q HERBERT
Vice Pres
I.P
The President
C. M VIGNOLES
C.B.E.
LT COL
S.J.M AULD
O.B.E., M.C.
P.P. I.P
H.C. TETT
-ESSO-
J.C GRIDLEY
C.B.E
-MOBIL-
LORD MILLS
K.B.E
Minister of Power
FRED MAY
A.C HARTLEY
C.B.E
H. HYAMS
Vice Pres
I.P
C. CHILVERS
Hon Secretary I.P
D.A HOUGH
T.D
Secretary
I.P
LORD GEDDES
C.B.E
P.P. I.P
H.E. SNOW
C.B.E.
SIR STEPHEN GIBSON
C.B.E.
P.P. I.P
& OF COURSE GEORGE SELL
our Editor

industry not only do think sometimes, but are equipped to do so.

So, in this connexion, I should like to pinpoint our various publications which are designed to spread technical and scientific information about the industry to the widest possible readership.

IP Activities

In addition to our two periodicals, which now enjoy a very high standing, and the various standard works of reference which are produced, we can, I think, be proud of the series of reports on our Summer Meetings. These have become an important store of facts and theories for everyone in the British industry, and are also sought further afield throughout the world. For this achievement, and indeed for the whole of our success in this field of publishing, we are grateful, and we owe a great debt to George Sell, our editor. (*Applause.*) We are greatly assisted also by our new premises, opened by our guest of honour just a year ago, and we are deeply and genuinely grateful to the oil companies whose generosity made the occupation of those distinguished headquarters possible.

As regards the Institute, I would only add our gratitude to our secretary, D. A. Hough, and to the permanent staff, on whom the working of the Institute generally depends, and whom we have to thank for this gathering to-night and all the organization that goes with it. (*Applause.*)

Britain's Share in Oil Trade

This is primarily a social occasion; an opportunity to meet friends, to talk, and it is certainly the duty of your president to be brief. But touching on certain points, which the Minister himself has mentioned about the oil industry, perhaps I may stress, as a British institute, the particular pride we have in the British share in world-wide oil enterprise. British organizations are now responsible for about a third of all the oil entering international trade, and on the marketing side have in recent years handled up to half of the world trade outside the United States and Russia. This in itself has led to large contributions to British export and British manufacturing and shipbuilding industries. Now, with the great development of world industry, activity which in our generation has more than doubled its energy requirements, oil here, as in other countries, is being called on to bear an ever-increasing share of the burden. This, like all processes of economic change, has brought its repercussions, even though they may be perhaps temporary; but as it would be out of place to develop the topical and rather controversial subject to-night, let it suffice to say that we are grateful to Lord Mills and Her Majesty's Government, for standing on the principles of a fair choice of fuel to the consumer which is essential if our manufacturing efficiency and export potential are to be fully utilized.

I doubt whether many realize how far oil has now penetrated into everyday activity. We have now come a long way from the days when oil for the lamps of China was our main interest, and motor spirit was burned to waste in the oilfields of Borneo. Apart from the contribution to energy requirements, higher standards of living allow the return to oil for greater warmth and comfort in our homes, and oil's contribution to transport is clear for all to see. But it is, as Lord Mills said, the petrochemical industry which has yet to be fully recognized. He told you something of the new and exciting materials which have been produced, and even amongst those, the plastic utensils, many of which will gladden our hearts, especially those of us who in sterner times had

to spend much of our time in the kitchen. All these have stemmed largely from oil in the first place.

The name petrol, a name coined by a British firm, Carless, Capel and Leonard, in the last century, was once probably as exotic as polyethylene, polyesters, and polyvinylchloride are now. The latter may well become a household word in the future.

Finally, in a recent speech, the Minister himself emphasized that the quality most needed in a changing world is flexibility, and has been kind enough to refer to that quality in the oil industry. Through a series of crises, including the last war and Suez, I think we may justly claim that the industry has never let the consumer, or the nation, down. Apart from such violent changes and upheavals in the pattern of supply that we have already surmounted, we continue every day to meet such changes. One month a threatened strike in an essential distribution centre like Singapore; another an actual strike in one or other of the widely dispersed oilfields in different parts of the world; a spell of cold weather on the Eastern seaboard of the United States, such as happened this winter, when one company alone had to deliver 800 thousand tons more oil in three weeks than was estimated.

All this leads to the point that the consumer has become perhaps a little complacent, and takes everything a little for granted. This can only be accomplished with service by wide planning for all eventualities in the first place, and readiness to co-operate in time of emergency amongst otherwise highly competitive units.

And finally, let us not forget that finding oil in the first place, refining, shipping, distribution, and planning of this kind to meet all emergencies, not to speak of meeting the ever-increasing demand, means a vast drain on resources, both of finance and material, and human effort, and can only be met by activities which can be allowed to generate such resources in the first place.

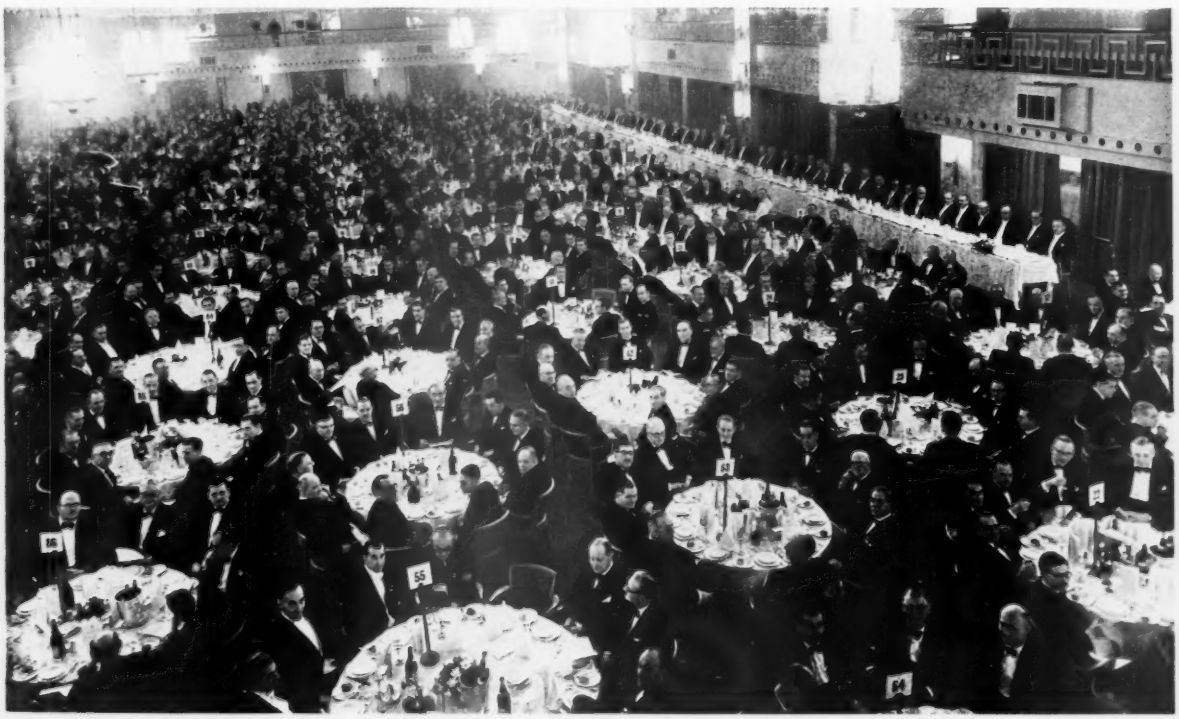
The Guests

Proposing the health of the guests, Mr Vignoles said:

Now I come to the much more pleasurable task, for you, of proposing the health of our guests. It would be obviously invidious to try and mention that multitude by name, but if I may take just a few groups: first, we are delighted to again have Lord Mills, a representative of the Government Department with which we have the happiest possible relations. We think sometimes we can help them, too, but they have never failed to help us when we ask them. And I associate with that group the representative of the United States Embassy—we are naturally delighted to have him in the light of the great Anglo-American association. Then we have representatives of the Services, who depend on us more than ever for their lifeblood in the increasing mechanization of the forces and apparatus of war. Also, we have the representatives of the learned and professional societies and the myriads of friends who are in this room. We are delighted to welcome the representatives and heads of the great oil companies, again representing both Anglo and American interests. After all, the first well was not drilled in Great Britain; it was drilled in America. And I should also like to say how pleased we are to see a representative of the Dutch end of the Anglo-Dutch combination.

The health of our guests is coupled with the name of Lord Monckton, who requires special mention. He is for the first time one of us, in his new capacity of chairman of the Iraq Petroleum Company.

Lord Monckton of Brenchley, P.C., K.C.M.G., K.C.V.O., M.C., replied on behalf of the guests.



The new north pier at Mina al Ahmadi shortly to come into operation

Kuwait Comes of Age

Twenty-one Years of Oil Development

On 22 April 1938 commercial oil first flowed in the Burgan field, Kuwait, and although due to the war it was not until eight years later that full-scale production could commence, Kuwait had produced over 426 million tons (over 3148 million barrels) by the end of last year. The total production for 1958, 69,117,138 tons, was over eighty-six times as large as the total of 797,350 tons produced in the seven months of 1946. Since 1953 Kuwait has been the largest oil-producing country in the Middle East and the fourth largest in the world.

KUWAIT HISTORY

Although, as mentioned above, Kuwait Oil Company has only been exporting oil commercially for 13 years, it was formed in 1934 and is jointly and equally owned by The British Petroleum Company and the Gulf Oil Corporation. It is the operator of a concession which was granted in December of that year. After exploration work, oil was found at Burgan at a depth of 3674-92 feet in 1938 as already stated.

Between 1938 and 1942, eight productive wells were drilled in the Burgan field and then operations were suspended until 1946. Since 1946 the Burgan field has been developed and extended and to-day has about 229 completed wells. In 1951 development drilling was extended to the Magwa area and in 1953 to Ahmadi Ridge. The Magwa-Ahmadi field is now a major producing area with 75 wells.

Later, attention was turned to the northern area and in 1955 oil was discovered at Raudhatain. Three wells have been completed for production in North Kuwait and a further 15 have been drilled to depth for completion when production facilities, now being installed, are ready in a few month's time.

H. H. The Ruler of Kuwait, Sheikh Sir Abdulla al Salim al Sabah, K.C.M.G., C.I.E. (seated centre) *with* (right) *Sir Philip Southwell, C.B.E., M.C., managing director of Kuwait Oil Company, and* (left) *A. S. Halford, C.M.G., H.B.M. Political Agent in Kuwait, at the formal opening of the refinery expansion in March* 1958

Oil Shipments

The first shipment of oil from Kuwait was in June 1956, tanker loading then being accomplished by means of submarine lines and sea berths. The increasing tempo of crude oil exports—768,441 tons in 1946, 2·1 million in 1947, 6·2 million in 1948—soon made these temporary loading facilities inadequate. Permanent facilities were planned and the construction of a jetty at Mina al Ahmadi was put in hand and, by the end of 1949, the largest oil jetty in the world was completed and has since established quite a few loading records.

Even this facility was soon to prove insufficient and, at the end of 1957, construction started on a new pier which will shortly

come into operation with two berths for the largest tankers so far visualized, and able to handle about 300,000 dw tons at one time. Loading rates of up to 6750 tons per hour will be possible.

In addition, the original five sea berths available are still in use and two new ones have been in operation for over a year.

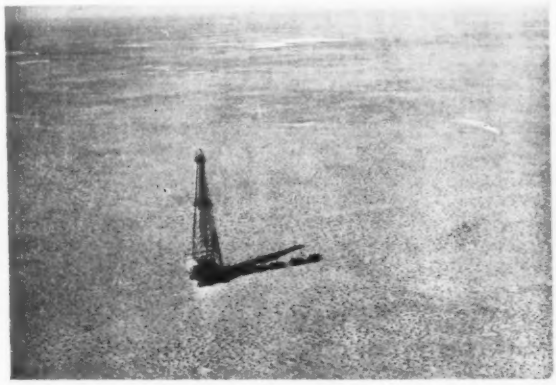
In 1958 nearly 63 million tons of crude oil was loaded at Mina al Ahmadi, total shipments to the end of that year being approximately 408 million tons. Over 22,000 tankers have sailed from Kuwait.

The Refinery

Coincident with the construction of the first jetty in 1949, a small refinery with an initial capacity of 25,000 barrels per day was built. More recently this refinery was expanded to 190,000 barrels daily capacity and the new plant was officially inaugurated by the Ruler of Kuwait in March 1958.

An aerial view of Ahmadi showing the tremendous growth in building on an area which only thirteen years ago was—

—like this desert over which a drilling rig is being transported from one site to another



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LABOUR STATISTICS FOR THE U.K. PETROLEUM REFINING INDUSTRY

The following figures are taken from the February 1959 issue of the *Ministry of Labour Gazette* (cf previous figures given in the *IP Review*, 1958, **12**, 389).

Figures in italics are the averages for all the industries covered by the tables

	Men (21 and over)	*Youths and boys*	*Women (18 and over)*	*Girls*	*All workers*
No. of workers covered by remuneration statistics...	20,049	851	1273	17	22,190
Average earnings in last pay-week in October 1958 (shillings) ...	274/10 *256/8*	128/3 *112/0*	143/11 *133/11*	— *86/9*	261/6 *217/4*
Average number of hours worked in this pay-week	48·7 *47·7*	44·7 *44·6*	43·6 *41·2*	— *42·2*	48·2 *46·0*
Average hourly earnings in this pay-week (pence)	67·7 *64·6*	34·4 *30·1*	39·6 *39·0*	— *24·7*	65·1 *56·7*
			Males	*Females*	
Numbers employed (December 1958)			34,500	7200	41,700
Numbers unemployed (at 12 January 1959)...			385	51	436

First British-Built Drilling Platform

The first mobile oil drilling platform to be built in the United Kingdom sailed from Southampton on 19 February on a 9200-mile sea journey to North Borneo. This structure, which was designed by the DeLong Corporation of America, was built at Southampton by Steel Structures Ltd, an associate of the John Howard Group of engineering companies and of the DeLong Corporation. Costing nearly £1 million the platform is on hire to the Brunei Shell Petroleum Company and will be used to continue exploration drilling in high seas areas up to approximately 40 miles off the west coast of British Borneo. In these areas four unsuccessful wells have already been drilled from three fixed platforms, one at Ampa Patches, about 20 miles off the coast of Brunei, two at Siwa, 8 miles off the coast of Sarawak, and a fourth at Hankin, some 30 miles off the west coast of North Borneo.

The platform will be completely self-contained, with air-conditioned living accommodation for 56 men, who will be ferried to and from the mainland of Borneo by helicopter. Food supplies and light freight will also be conveyed to the platform by helicopter.

The platform is fitted with four retractable legs, 235 feet in length and 10 feet in diameter, although for reasons of stability they will be only at half length for the sea journey and will be completed on arrival. When the appropriate drilling site is reached these legs will be lowered until they reach the bottom of the sea; at this point a powerful hydraulic mechanism is engaged, which literally causes the entire platform to "climb up on its own legs" into a position where it is quite clear of any lifting action from the waves. When drilling is finished the platform is lowered into the sea, the legs are raised and it can be towed to another location.

The platform is designed to withstand waves up to 30 feet when operating in 100 feet of water, but in certain conditions can be used in water depths down to 125 feet. The dimensions are:

Length	190 feet
Width	106 feet
Depth of Hull	16 feet

The platform will be equipped with an Ideal 80 B drilling rig, having a maximum depth range of 12,000 feet, and with two E 500 Ideal slush pumps. Gross weight of the platform all in, will be 5400 tons.

The drilling equipment will be powered by three Paxman diesel motors, and three generators, each of 260 kW, will supply the power for the ancilliary equipment.

The platform, which contains 3000 tons of steel is being towed by a 3000 hp tug supplied by L. Smit of Rotterdam. The voyage is expected to take over three months.

It is understood that a smaller version of this type of drilling platform has been ordered by Shell for use in Lake Maracaibo, Venezuela.

One of the four retractable legs. At this stage 120 feet long, but to be increased to 235 feet by the addition of further sections when on site

Orient Explorer *at Southampton during the final construction stages. The drilling structure will be at the left-hand end, the crew quarters and helicopter platform being at the right*

A Shell photograph

Petroleum in Parliament

Fuel and Power Policy

On 6 February the House of Commons held a debate on the country's fuel and power policy, now and in the future. The member moving the Motion for the Opposition, William Blyton (Houghton-le-Spring) asked the Government to present proposals for a balanced policy, and that a direction should be given to the nationalized power industries that priority be given to the use of coal in the production of gas and electricity. The policy of generating electricity by the use of oil in the power stations should be changed in favour of coal.

On the subject of coal and oil in the gas industry Mr Blyton said that the use of coal had declined from 27·8 million tons in 1956 to 24·8 million in 1958.

The amount of oil used had risen from 0·49 million tons to 0·7 million in 1958, a great proportion of the rise being in oil used for gasification purposes. Forty oil gasification plants were said to be in operation or under construction, and would have a capacity of 100 million cu ft/day. With the addition of refinery gas reforming plants, a trial plant for using imported liquid methane, and an oil hydrogenation plant, the total gas-producing capacity of all these plants was 187 million cu ft/day. This capacity was equivalent to the carbonization of 4·5 million tons of coal a year, from which it could be assumed that the production was equivalent to the carbonization of 2·87 million tons of coal.

Regarding the gas bought from oil refineries in 1957 this was said to have amounted to 1500 million cu ft, rising to 7465 million in 1958. In contrast purchases of gas from coke ovens fell from 96 million cu ft in 1957 to 94 million in 1958.

It was further said by Mr Blyton that it should be recognized that in general coal did not emit sulphur to the same extent as oil, as the sulphur contents of industrial coals were less than those of imported oil.

The speaker concluded by saying that the Coal Board was not free to fix its price as the oil companies were, and that it must have that freedom if it was to compete with oil on an equal footing.

Gerald Nabarro (Kidderminster) said that the increased use of oil in the nationalized industries mentioned was because oil was so clean, so flexible, so highly efficient, so easily controlled, and so relatively stable in price. Coal had gone up in price by more than 25 per cent since 1951, but the price of fuel oil was to-day the same as it was in 1951. Sir Albert Braithwaite (Harrow, West) dwelt on the "menace" of the vessel arriving in the U.K. with imports of liquid methane from the U.S.A., and the likelihood of further shipments. These imports, it was said, would ruin Britain's carbonizing industry.

An interesting estimate of the U.K.'s future energy requirements was given by David Price (Eastleigh). Having gone through various published estimates on the subject he said that he thought that by 1980 the U.K. would be requiring 360–370 million tons of coal equivalent. Of this figure he suggested that 2 million would come from water, 220 million from coal, 38–48 million from oil, and 100 million from nuclear energy.

The accusations of unfair bias against the coal industry, in favour of oil, were reiterated by Alfred Robens (Blyth). On the subject of comparative prices he said that unless a power station was on an estuary, where oil could be unloaded easily, it was very doubtful whether at any power station in the country oil would have the edge on coal on a purely price basis. It was said that the Coal Board was prohibited from competing with the oil industry in the price sphere because under its Statute it was not allowed to discriminate. Whereas the oil companies could offer rebates the coal industry could not. Whilst there was no disclosure of such special rebates by the oil companies, in the case of a public corporation there would be complete disclosure of any such rebate on their part. The coal industry had to sell its product at exactly the same price to every single user.

The Parliamentary Secretary to the Ministry of Power in his reply said that everything concerning the motion had been an appeal to the Government to hinder oil and to encourage coal. Replying to the suggestion of taxes and other like methods to hinder the switch towards oil, he said that oil was a great industry that British initiative and enterprise had developed. It was said that it was a wonderful thing when one thought of the size of Britain, which had no oil, that here was by far the greatest item in international trade in the world, and the bulk of it was in British hands.

The Parliamentary Secretary revealed that the oil companies, the Central Electricity Generating Board, and the Coal Board, were considering together whether it was practicable to postpone the conversion of two more power stations to oil during 1959. This was a gesture by the oil companies to the coal industry in its present difficulties. The coal required for the two power stations would be, very roughly, something up to 1 million tons.

Coal and Oil Consumption

The Parliamentary Secretary to the Ministry of Power said in an oral answer on 16 February that 80 per cent of Britain's inland fuel consumption in 1958 was met by coal, and 19 per cent by oil.

Government Emergency Oil Reserves

On 9 February it was revealed, in answer to questions, that during the present financial year the Government is to increase expenditure on the purchase and storage of petroleum products by £6,322,800 to meet increasing energy requirements. This solely concerns stocks of petroleum bought by and on behalf of the Government for national emergency.

Costs of Liquid Methane Imports

The Parliamentary Secretary to the Ministry of Power said on 9 February that the estimated cost to the gas industry of the initial import of liquid methane to the U.K. would be about £12½ million. The costs of the experimental shipment were being shared by the British gas industry and the American interests concerned.

Gas from Oil

On 9 February it was said by the Parliamentary Secretary to the Ministry of Power that the gas industry estimated that its consumption of tail gas and other oil refinery surpluses might increase, in terms of coal equivalent, from the present level of about 500,000 tons to 2 million tons in 1965.

Government Holdings in B.P.

The Secretary to the Treasury, in a written answer to a question on 23 January, said that his present estimate of the value of the Government's holdings in The British Petroleum Company Ltd was about £304 million on the basis of Stock Exchange closing prices on 20 January. This represented some sixty times the cost of the original investment.

*Transporting Liquefied Methane**

by **CHARLES I. KELLY (Fellow)**

Introduction

The changes which have taken place in the coal-mining industry, and in the markets for both primary and secondary fuels, have caused U.K. and European distributors of conventional town gas during the past few years to study more intensively hydrocarbon natural gases. These changes and the purpose of these researches in turn are causing reactions in the political sphere.

Because some coals most suitable for gas-making are in short supply, the Gas Boards have been seeking new raw materials which can be cheaply converted into a very clean and well-refined gas to compete against electricity and petroleum fuels in the domestic market. Concurrently, coal interests are agitating politically against the use as a primary fuel of imported petroleum, which is being blamed for a decline in the consumption of indigenous coal. Nonetheless, during 1957-58 the Gas Boards in the U.K. turned 580,000 tons of oil into gas. In addition, under research programmes sponsored by the Gas Council, the Boards are conducting large-scale experiments to discover the best and cheapest methods for the conversion of oil products into clean town gas. These grades include the whole crude oil and heavy fuel on the one hand and both gas oil and light petroleum distillates on the other. All these have their origin mostly in crude oils produced in the countries of the Middle East and Venezuela. The light petroleum distillates made in the U.K. are available for use in gas-making because the refining of the particular imported crude oils provides them in amounts which cannot be totally consumed in the units installed for their upgrading into gasolines, and by their conversion into raw materials required by the petroleum chemical industries.

The Gas Boards' interests extend beyond the above-mentioned readily-available oil products. They would also like to manufacture town gas from liquefied petroleum gases, and from liquid refinery gases (LPG and LRG) and from all the "tail gas" they can acquire from oil refiners under long-term contracts. Their interest in these gases may not be unconnected with the negative results of the search for natural gas in the U.K. and the latter results will probably intensify the study now being made by the North Thames Gas Board, for the Gas Council, into ways and means which will enable them to import natural gas in its cold liquid state. It is because they have called this product "liquid methane" that the title chosen for this paper is "Transporting Liquefied Methane".

Storage Tanks for Liquefied Methane

Liquefaction presents no problems other than those which arise from the cost of liquefaction. Conversion of cold liquefied methane into free gas at normal temperatures is a simple process. But liquefaction of natural gas and the transportation of the liquid presuppose the availability of containers which are suitable for its retention in the liquid state over long periods of time. Attention will therefore be drawn, in this section, to the efforts made to provide suitable *static* containers for the cold liquid and receptacles for use in its transportation by water-borne craft. Descriptions will of necessity be very brief but they will suffice to illustrate the development, the kinds of metals of construction used, and how differences in time and circumstance seem to have conditioned not only the size and geometry of the receptacles built, but also the kind of insulating material employed.

A small-scale liquid storage and regasification (L.S. & R.) unit, built at Cornwell, West Virginia, in 1939 contained a storage tank, probably shop-fabricated, 18 feet long and 10 feet in diameter which was insulated *on the outside* by a 2-feet thick layer of formed cork, and rested horizontally on wooden trestles. The metal used was 2 per cent nickel steel. The tank, a small unit for the liquefaction of pipelined natural gas, and another for the re-gasification of the liquid, were operated for four months in a closed cycle and therefore under rather favourable conditions. With the knowledge of metal-behaviour and operational experience thus gained, a large commercial-scale unit was designed and constructed in Cleveland, Ohio, in 1941. The storage tanks, three in number, were spherical in shape and 57 feet in diameter. The lower half of the outer shell made of standard carbon steel, was fabricated first and lined with a 3-ft layer of formed cork. Inside this, the inner shell, to be wetted by the cold liquid methane, was fabricated from de-oxidized, low carbon, 3½ per cent nickel steel plates welded together with stainless steel rods containing 25 per cent chromium and 20 per cent nickel. When the remainder of the outer shell had been erected around the inner shell, the intervening 3-ft thick space was filled with granular cork. The whole assembly in each case stood on legs solidly connected to the outer shell only. Erection of the plant was begun in September 1940 and completed in January 1941. For 2½ years the plant served to liquefy dry purified pipelined natural gas (85 per cent methane, 8·5 per cent ethane, 3·6 per cent propane, 1·4 per cent butane, and the rest higher hydrocarbons) during the summer months in readiness for regasification; thus, the pipelined supply of gas could be augmented appreciably during severely-cold winter days when demand exceeded the ability of the pipelines to convey gas to the company's system. As the war progressed, war-time industries increased the load on the system. Consequently, the company added Tank No. 4 early in 1944. Torosegmental in shape, fabricated from metals like those used in the construction of the spherical tanks, it measured 70 feet in diameter and 42 feet in height. The space between the inner and outer shells was filled with rock wool insulant, because supplies of cork had by then been rendered small by some mysterious fires at cork-storage depots.

This tank differed from the spherical ones in other features. Its whole weight was transmitted through inner and outer

* Read before the IP Economics and Operations Group on 13 November 1958, and brought up-to-date in regard to the *Methane Pioneer* experiment.

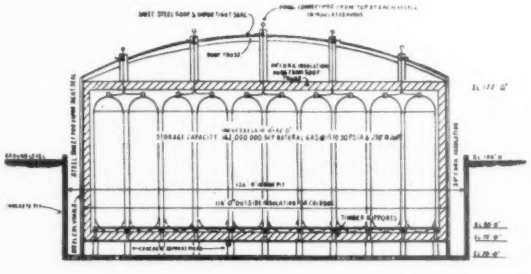
circular girders in the base of the inner shell, through two circles of 30 and 60 wooden posts (insulators), on to two re-inforced concrete ring-foundations. A site plan showed the compact arrangement of the storage vessels, buildings, etc, a railway system to the north-west, four public highways on the other boundaries, and close-by factories.

Six months later, on 20 October 1944, this No. 4 tank failed without warning, and spilled its 935,000 Imperial gallons of liquid content over the site. Some vaporized methane caught fire, and radiated heat made No. 3 spherical tank collapse and add its 310,000 Imperial gallons of liquid content to the conflagration; 128 persons were killed, up to 400 injured, and about £2·5 million worth of property damaged. This disaster which befell the only plant of its kind in the world in which large volumes of liquefied methane were stored at low temperature and low pressure, undoubtedly retarded further developments in this sphere.

Although several bodies investigated the disaster no final conclusion was reached as to what actually caused it. The probability is that the steel became brittle at the low temperature of the stored liquid and was fractured by seismic shock transmitted to it through one or more of the wooden posts. A point which deserves emphasis is that two of the spherical tanks not only survived but contained liquid methane after four days of fire-fighting had extinguished the conflagration.

The U.S. Bureau of Mines in its report recommended among other things that: liquid methane tanks should be surrounded by dikes; low-carbon 3½ per cent nickel steel should be used again only if its properties had been proved to suit the *particular* design; frost spots (which at one time or another had formed on the outer shells of all four tanks) should be regarded with suspicion; and, not only should the site be isolated, but also the boundary of the area containing the liquefaction unit and liquid storage tanks should be more than one-half mile from the nearest inhabited building.

At this point in time, 1958, the only working L.S. and R. unit for liquid methane use exists near Moscow in the U.S.S.R. This is reported to consist of a cold box, 116 ft square by 50 ft high, and to enclose ten rows of ten vertical cylinders each insulated by 2½ ft of cork board. It has its base below ground level and earth bunds around it. No details of the steels' composition and the size of the site have been published, though it has been reported the 100 cylinders can hold a total of about 1·7 million Imperial gallons of liquid methane, each cylinder measuring 10 ft in diameter and 42 ft in height. The whole plant was designed in 1947 in the U.S.A., most of the fabricated parts went to the U.S.S.R. under Lend-Lease, and the Russians themselves completed the erection of the installation in about 1948.



Courtesy *Gas Age*

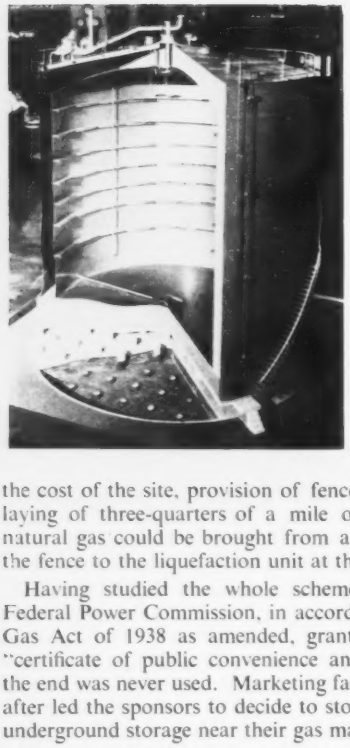
LSR unit near Moscow

Courtesy North Thames Gas Board and Whessoe Ltd

The exterior shell of one of the tanks for 1000 *tons of liquid methane at Canvey Island*

Another L.S. & R plant was designed in the U.S.A. after that date, but it was never built. Intended for Chicago, its plans were made public in 1949; these offered two designs for liquid methane storage. One took the form of a cluster of cupro-nickel cylinders placed vertically inside a copper tank insulated by foam-glass blocks. An insulating powder of the expanded silica type filled the voids between the cylinders. The other type of storage tank had a sandwich-like design: the cold liquid would wet the inside of a tank made from doubly-corrugated copper sheets, seam rivetted, and silver soldered. This was to have been backed by wooden slats, then block insulation, and all contained inside a secondary lead tank outside which was to have been another series of insulation and secondary tanks. The concrete walls and base of the tank would have been prevented from freezing by the circulation of air through flues built into them. Their bases would have been placed above the water-table's highest known level and the completed tanks built inside a pit or surrounded by high earth bunds. The plans spoke of a site measuring about one mile square; indeed the plans for the entire unit satisfied most of the U.S. Bureau of Mines' recommendations.

The metals of construction chosen were cupro-nickel, copper, silver, and lead. These belong to the group occupied by aluminium, gold, platinum, etc, which are single-phase metals having face-centred cubic lattice crystal structure, and are particularly adaptable for use at extreme low temperatures. The choice of them and the elaborate designs,



Courtesy North Thames Gas Board and Whessoe Ltd

Model of one of the Canvey Island tanks

intended to prevent any repetition of the Cleveland plant's failure, probably inflated the estimated total cost of the whole plant to $6 million. However, of this sum, $383,000 or 6·4 per cent represented the cost of the site, provision of fences, and the supply and laying of three-quarters of a mile of pipe through which natural gas could be brought from a main trunk line near the fence to the liquefaction unit at the centre of the site.

Having studied the whole scheme and the plans, the Federal Power Commission, in accordance with the Natural Gas Act of 1938 as amended, granted to the sponsors a "certificate of public convenience and necessity" which in the end was never used. Marketing factors which arose soon after led the sponsors to decide to store peak-load gas in an underground storage near their gas market.

The next date of historical importance came in 1954 when news circulated of an attempt to provide means for the transportation of liquefied methane in water-borne craft. Willard L. Morrison of the Chicago Stock Yards then intended to use a unique combination of metal tank and insulant deemed suitable to contain liquid methane on board barges. There were to move from gas-sources in the south along the Mississippi river to Chicago. Low cost steel plates were to be welded into vertical cylindrical tanks and these were to be lined *inside* with balsa wood panels to a thickness of 14 inches, suitably cemented together, and the thickness was to be reduced to 12 inches by pre-compression methods. Each double-hulled barge 264 feet long and 52 feet wide was to be fitted with five such tanks, each able to contain 7000 barrels of cold liquid methane. The scheme envisaged the movement of the barges, in pairs, by a tug fitted with a power unit which would consume the "boil-off" methane gas as fuel. Moved in relays at suitable time-intervals, these barges were intended to deliver gas to Chicago at a daily rate of 18 million standard cubic feet. Included in the scheme was the construction of a barge equipped with a complete liquefaction plant. Hence, it would have been possible for the proprietors to draw supplies of natural gas, under high initial pressure, from natural gas wells within economic reach of a water-way but too far from an existing gas pipeline for the wells to be economically connected to it and gas markets. One tank barge and the liquefaction barge were in fact constructed in 1954.

Morrison's scheme never operated in the intended way. Not one barge load of liquefied gas ever reached Chicago. The U.S. Coast Guard regulates goods and craft which may ply on specified U.S. inland waterways and coastal waters. The Federal Power Commission approves, or otherwise, schemes involving the transfer of gas from one State to another, in the U.S.A. Mr Morrison seems to have fallen foul of both authorities.

The announcement of the proposed scheme did however fire the imagination of planners in U.S. financial houses and of others in some European centres. A result was the appearance of proposals based on paper-studies, covering the transportation of liquefied natural gas in water-borne craft from overseas sources of natural gas to world markets hungry for cheap gas. The implementation of these proposals was conditional upon the successful practical expression of Morrison's barge scheme.

A second blue-print on this same subject appeared in 1955 when Crecca presented a serious thesis to the Lehigh University. In it, he suggested a way to convert a T-2 tanker into a liquid methane carrier. This he used, on paper, to transport liquid methane from sources of assumedly-*cheap* methane in the U.S. Gulf zone and Venezuela to established natural gas markets in Philadelphia and also to Southampton, England.

He fitted eight main and two small liquid methane tanks around the centre-line of the ship, and intended to use the wing and inner bottom tanks as oil-cargo tanks. The ship's power units could consume as fuel either the "boil-off" methane gas or fuel oil carried aboard in separate fuel tanks. When fuel oil was consumed, the "boil-off" gas could be re-liquefied on board and returned to its tanks. In all his calculations he allowed for a daily loss of one-half of one per cent of methane from the liquid cargo.

For the construction of the liquid methane tanks he rejected cupro-nickel and aluminium and its alloys and adopted stainless steel. Like Morrison, he lined these *on the inside* with insulant; unlike Morrison, he put 10 inches of polystyrene foam next to the metal's surface and separated the foam from the cold liquid with a 2-inch layer of balsa wood. Each tank stood in its own cold-room, the metal walls, bottom (specially installed), and roof (the deckplates) of which were lined on the inside with fibre glass insulation. This would protect the ship's structure in the event of a tank releasing some liquid methane through a leak. Though Crecca was not completely satisfied with the design as a whole, he costed the operation of the ship when delivering liquid methane to Philadelphia. This he could do at a price lower than the delivered price of pipelined gas. He also could transfer liquid methane to Southampton at a delivered price of from 2·07 to 2·72 pence a therm. This low delivered cost could obtain only if: the tanker had been converted in a

An insulated aluminium road tanker for conveying 14 *tons of liquid oxygen*

Courtesy British Oxygen Co. Ltd and Scammell Lorries Ltd

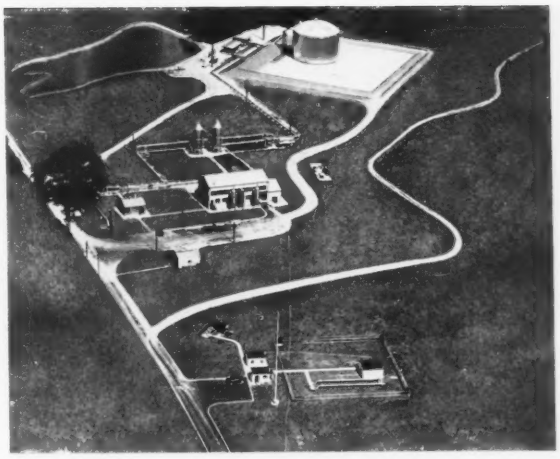
cheap-cost foreign shipyard; the raw gas, 100 per cent methane, had cost 8 cents a M cu ft; the boat sailed under a foreign flag and the crew received rates of pay lower than the U.S.A. rates; and the tanker carried an oil cargo in the wing and bottom tanks.

The foregoing brief historical account shows clearly that technical success will attend on attempts to transport liquefied methane by sea only if, among other things; (a) the tanks are made of prudently-chosen metals which will not develop brittleness at very low temperatures; (b) efficient insulants are employed to minimize evaporation losses during transit and to protect the ship's structural members in the event of one of the tanks releasing some cold methane, as liquid; (c) provision is made to cater for the change of a tank's size when cooled (or warmed up afterwards) and of a change of shape induced by hogging and sagging and rolling of the ship when in heavy seas; (d) the use of good fabrication and operational techniques; (e) the provision of storage space for use by a ballasting cargo (liquid methane only weighs 4·2 lb an Imperial gallon); and (f) not the least, conformity of the whole scheme to the requirements of official bodies.

The latest attempt to move liquid methane by sea is the joint effort of the British Gas Council and The Constock Liquid Methane Corporation. They have converted a dry cargo boat into a liquid methane carrier in a U.S. shipyard at a cost of about £1·6 million. It carries 2000 tons in five tanks constructed from aluminium alloy plates, insulated on the outside with balsa wood, each unit being contained in a steel form (not necessarily the ship's hull). The design thus departs radically from the one used by Morrison for the tanks built into his river barge. Re-named the *Methane Pioneer*, the lines of the ship at the forward end differ from those of the original boat. The raw gas is supplied by the Continental Oil Company, a partner of the Constock group, and is liquefied on board Morrisson's liquefaction barge in Lake Charles, Louisiana. The first transatlantic crossing was completed in February 1959, under the management of British Methane Ltd, a company registered in Bermuda.

The cargo was discharged into two tanks which have been constructed at Canvey Island on the North Thames Gas Board's site next to the depot of the Regent Oil Company. Constructed of aluminium alloy, the space between each tank and its outer shell is filled with intumesced volcanic ash insulating powder. It is intended to re-gasify the cold liquid, and to transfer the gas at up to 270 psi pressure through a 16-mile long pipeline to Romford gas works. There it has been reformed into gas with a heating value of 500 Btu a cubic foot and burning characteristics which will fit it for entry into the Gas Board's grid.

A road tanker for conveyance of liquid methane at —180°F
Courtesy Shell Chemical Co. Ltd and Scammell Lorries Ltd



Courtesy Atlanta Gas Light Co.

The Atlanta Gas Company's Riverdale propane plant as originally constructed. To the left of the storage tank is the refrigeration shed. Centre is the compressor building, the tall structures behind it being gas-fired vaporizers for vaporizing the liquid propane

The Cost of Natural Gas at Source and Delivered

Authors of paper-studies have forecasted substantial rewards for promoters of schemes covering the transportation of liquid methane in water-borne craft. Willard Morrison (1954) was one. Later, Burns & Clarke of the North Thames Gas Board (1956) estimated the overall cost of purification, liquefaction, storage, and sea-transportation of liquid methane from Venezuela to London to lie between 4 and 4½ pence a therm. (They excluded the gas-material cost.) This figure, when confirmed last September at Piacenza, was circumscribed by two qualifications: it excluded the cost of the gas and the project as a whole had to be Government-owned or Government-financed.

It seems therefore not to be inappropriate to enquire what may be the price, at source, of natural gas *streams selected for this traffic*. Morisson (1954) said nothing about this item. Prices as low as about 2 cents a cu ft have since then been suggested. However, Burns and Clarke (1956) had this to say about prices of natural gas at source, that " . . . the production costs of gas (associated with oil) are a matter of accountancy . . ." and they pointed to the *average* price of U.S. casinghead gas at the well-head then to have been below 1·5 cents a therm (17·5 cents a M cu ft).

The Gas Council and Associates having originally intended to derive supplies of raw gas from Venezuela, the question arises whether it is sound in principle, although it may be convenient as an expedient, to use (as have fob prices at U.S. Gulf ports for crude oil and their products) an *average* U.S. gas price as a yardstick of a price likely to be charged for natural gas in Venezuela.

However, an indication of possibilities may be acquired by assuming the price of natural gas at Venezuelan or U.S. Gulf sources to be 20 cents a M cu ft. The Burns and Clarke

Courtesy the Gas Council

Methane Pioneer *during her trials in the Gulf of Mexico*

figure quoted above now becomes something between 5 and 6½ pence a therm as the price of gas (liquid methane) at the Canvey Island site—on paper, at least. Similarly, the Piacenza figure also rises to what may be called the "magical sixpence a therm" price for Western Hemisphere gas delivered as liquid alongside Canvey Island at the mouth of the River Thames. This *delivered* price may be compared with the 13·37 pence a therm declared to have been "The Cost of Gas and Products (net)" which characterized North Thames Gas Board's operations in 1957/58.

The Availability of Natural Gas

Another appropriate enquiry to be pursued is whether or not natural gas is available in sufficient amounts, over a sufficiently long period, for use in a new liquefied methane trade on an international scale. The Venezuelan oilfields have figured largely in paper-studies. Fortunately, official Venezuelan statistics on gas have been published. In absolute terms, they show the volume of gas not sold or used in the production and refining of crude oils in 1951 to have been 675,000 million cubic feet and in 1957 twice that amount or 1,134,000 million cubic feet. The question to be answered by would-be exploiters of this gas is whether this volume of 1·1 million million cubic feet of gas not profitably consumed in 1957 was then available, in the broadest sense of the word, and would be available annually for a reasonably long period of years after that date, for use in international trade.

The Middle East oilfields as gas-sources have been looked at also by authors of paper-studies. Official statistics for the rate of production of natural gas in the Middle East areas are not available. One group of investigators (1954) quoted 500,000 million cubic feet of gas a year to have been on tap in one Middle East oilfield for their scheme. Burns and Clarke (1956) declared an amount of 300,000 million cubic feet a year to have been procurable from what appears to be another Middle East oilfield. At the same time, it may here be noticed that the lack of officially published gas statistics prevented the latter authors from including details of the *total* gas produced in the Middle East area, in their world map and its tabular graphs. Hence, the answer to the above-posed question can not be reached until it is known: what are likely to be the annual figures for crude oil production for many years ahead, in the Middle East; and, the amount of casinghead gas, a by-product of oil production, which will concurrently be consumed in the economic production of oil, its delivery to sea-ports, and for the generation of power and other utilities for local consumption. For example, The Arabian American Oil Company declared in 1957 that their future oil production schedule would involve the utilization of some 56 per cent of their by-product casinghead gas production.

Some Consequences of the Proved Technical Feasibility of the "Methane Pioneer" Tests

If it be assumed that the *Methane Pioneer* experiments have been concluded and that their sponsors have proved sea-transportation of liquid methane to be an unqualified success, technically and economically, what may be some of the consequences?

One result will surely be that the world-wide interest which has been continuously manifested in the work will be intensified and many who now seem to be hibernating will quickly exhibit a most spectacular and vigorous activity. For example, Japanese interests have already claimed they have overcome the technical problems to be met in the designing and construction of a liquid methane tanker (except for a few minor details). Many of the new activists will be U.S. bodies and shipping interests as well as several European groups, all of whom show signs of having limbered up, ready to attempt to snatch a flying start.

Another result may be that facilities for the land-storage of refrigerated natural gas liquids will be used with increasing confidence. Recent developments in the U.S.A. support this opinion. For 18 months, the Atlanta Gas Light Company has been using a land installation for the storage of liquid propane, refrigerated to maintain it at its normal boiling point of *minus* 46°F. The original storage capacity has recently been trebled. To be associated with this trend may be the parallel one of an increasing use of sea-going tankers for the international movement, at their sub-zero normal boiling points, of natural gas liquids such as LPG, *i.e.* propane-butane (and like material such as LRG, *i.e.* liquefied refinery gases) and, LNG, *i.e.* liquefied natural gas, substantially methane-ethane and which for the sake of convenience has frequently been dubbed "liquid methane".

A further consequence may be the inland transportation of these commodities, by road and rail, at their normal boiling points and under low pressures. The use of such facilities, in association with the sea-transportation of refrigerated natural gas liquids, can confer on the new trade the benefits of flexibility in inland distribution now enjoyed by those who handle the conventional liquid products of crude oil.

Advances already made in allied technical spheres point the way. Liquid ethylene has for several years been moved along the roads of England, at very low temperatures, in officially-approved road tankers. It has also been transported in Europe for about three years, by rail, in loads of up to 5700 Imperial gallons at a "liquid-in-the-tank" temperature of *minus* 180°F. This is but 80°F *warmer* than the normal boiling point of liquid methane. An example is a rail tank car with an initial internal pressure of only 1½ psi. It has traversed distances of up to 300 miles with all valves closed. When used as a storage tank in the open for 40 days, the internal pressure may reach an approved value of only 30 psi. Again, in England, as in other countries, liquid oxygen, for example, has for numerous years been stored in special *static* tanks at its normal boiling point; and it is being transported, at least in Great Britain, in special road tankers fitted with aluminium-type tanks, suitably insulated, which operate at "liquid-in-the-tank" temperatures around *minus* 297°F. This is some 40°F *below* (colder than) the normal boiling point of liquid methane.

This crystal ball gazing also suggests that petroleum chemical plants may not need to be clustered, as they now are, around oil refineries in which their raw materials are made. The means to this new end could have been included in Burns and Clarke's pictorial representation of the sequence of events in their liquid methane scheme, from gas-source to port of importation, by the insertion of symbols to represent road and rail transports, for inland distribution of liquid methane, at a point between the shore tanks and the gas-reforming stage (the one in which they were most interested in 1956). Indeed, it may be inserted here, for the sake of historical interest, that liquid methane has been transported at its normal boiling point, by road in England, in 32-gallon, vacuum-jacketted tanks made of copper and austenitic steel, when its use as a fuel for bus engines was being investigated during world war II.

Manufacturing schedules may also be affected by these developments, particularly of those refineries in the Eastern Hemisphere, which are based on forecasts of consumption-patterns and the nature of the feedstocks available to the refiners. In this connection, a trend should be noted which is already developing in the Continent. Scattered pipeline systems of town-gas utilities are being integrated into one large Western European system, a part of which can easily be the already well-integrated one in the Ruhr. The French national gas grid based on the proved gas reserves in the Lacq district will connect many of these local systems and touch many large ports. It will require no very great extra capital expenditure to enable this integrated system to be fed at deep-water ports with (re-gasified) liquid methane brought into them by tankers. Also, it may not be far off when natural gas may enter the integrated European gas grid from Italy in the south, and from the U.S.S.R. through Eastern European countries, to augment the injection of natural gas brought by sea from Venezuela, the Middle East, and elsewhere.

Quantitatively, the possibilities are equally compelling. The new methane tanker and other allied developments mentioned above can bring to the fuel and power markets of the Eastern Hemisphere an annual amount of natural gas equal in heat content to some 77 $\pm$25 million tons of oil. Had this rate of gas consumption obtained in the Eastern Hemisphere in the year 1956, the use-pattern of oil and gas would not have been the one shown on the right of the illuminating tabular graph included in the paper presented by M. Hubbard last September at Montreal to the World Power Conference. It would have resembled closely the use-pattern depicted for the Western Hemisphere. A consequent effect of the consumption of so much natural gas in that market area would no doubt have manifested itself in appreciable alterations in the actual 1956 price-structure of crude oils and their products.

No further emphasis will be needed to support the view that transportation of liquid methane by sea on a large scale, coupled with the use of technical developments in allied spheres, will compel forecasters to consider new aspects when they revise their estimates of demand in the Eastern Hemisphere for crude oils and their products, which are derived mainly from the Middle East and Venezuelan oilfields.

Indeed, it seems not unlikely—should liquid methane transportation by sea, road, and rail assume large proportions—that current estimates of the energy gap to be filled in the next 5, 10, or 20 years, by oil and its products will have to be drastically revised. In addition to coal, hydro-electricity, and atomic energy, cheap natural gas will take a share of the Eastern Hemisphere's energy markets, before oil gets its opportunity in the same region.

DISCUSSION

To questioners asking how far liquid methane could be piped to or from storage tanks, and what loss there would be in such an operation and in the cooling of storage tanks at the port during the unloading of a methane tanker, a speaker replied that vaporization losses were very high indeed when liquid oxygen was transported by pipeline, though it was a practical proposition over short distances within a single factory. It may perhaps be just practicable with liquid methane, though much would depend on continuous pumping or circulation, and in the capacity of the pipeline, etc. The author added that, in the Cornwell pilot plant, it took four days to cool all low temperature equipment and produce the first amount of liquid methane, whereas in the Cleveland plant, with its three spherical tanks, the cooling and starting-up operation took 12 days. In both cases, liquefaction units were involved. In any case, the initial operation of any new processing equipment was lengthy and somewhat costly, as indeed it would be even with a large atmospheric distillation unit. It in its own sphere ought not to be heated up too rapidly.

A questioner sought knowledge of the overall yield which could be considered to be practical, *i.e.* in terms of the initial gas in a gas field, from which gas has to be taken for refrigeration purposes, the transportation loss, and losses incurred during both storage at the receiving end and conversion into town gas. The author replied that no standard answer could be given without it having been stated where the gas-source was and what was the composition of the gas. Raw gases, like Lacq (French) gas and several gas streams in the Middle East contained up to 25 per cent of hydrogen sulphide and carbon dioxide. These would have to be removed. During liquefaction, Burns & Clarke had budgeted on a 10 per cent gas consumption (power generation), and others from 16 to 20 per cent depending on the liquefaction cycle chosen. Re-gasification of liquid during unloading and the first-cooling of a tank installation at the port of destination would be sizeable, but the gas need not be lost; it could go by pipeline to the reforming unit, where the reforming loss in therms need not be greater than some five per cent.

Another speaker emphasized the importance of recovering the by-product "cold". The author replied that recovery of "cold" figured large in Morrison's Mississippi barge scheme (which did not come into commercial operation) because at Chicago the stockyards consumed much "cold". It had a probable value of about one penny a therm of liquid methane. Recovery of this by-product, he believed, would not enter into the North Thames Gas Board's experimental shipments.

Another interesting question centred round the necessity or otherwise for stripping the butane and propane from raw gas before liquefaction. The author in reply quoted from Burns & Clarke's paper (1956) ". . . From the technical aspect, it is not a matter of primary importance whether the heavier hydrocarbons such as propane and butane are removed from the gas prior to liquefaction, as they can remain in true solution in the liquid methane and do, in fact, raise the boiling point, thereby reducing the amount of energy required to liquefy the gas. The presence of these heavier hydrocarbons raises the calorific value of the re-evaported gas . . ." To this the author added the comment that care would have to be taken as to how far up the molecular weight scale would be the included heavier hydrocarbons. Benzene present in some gases in small amounts crystallizes at about 32°F. and seemed not to be very soluble in liquid methane. Even *iso*-butane, with a melting point of 30 F. *above* the boiling point of liquid methane, might cause trouble if included in too large amounts. These proportions could be chosen after reference to solubility tables.

At one point, Dr James Burns intervened to say that the liquid methane project as a whole was extremely interesting, full of economic possibilities, and no more than economic possibilities. He considered it fair to say that if these economic possibilities did not in fact exist, the present experiments would not have been undertaken. There is a very great potential supply of raw material in the world which could add new raw material for gas-making to those countries which like ours, were not sufficiently fortunate to have supplies of indigenous natural gas. He did not think importation of natural gas was going to have any great or material effect on the oil industries. The oil industries in America, for example, did not go bankrupt because gas pipelines were laid from Texas up to New York. The oil industry would be likely to share in the benefits of any new industry based on the use of oil or oil products. The liquid methane was ripe for technical development and if we in Britain did not show some initiative and enterprise on the technical side, people in other countries certainly would.

Reference to the possible effects on the oil industry was taken up by another speaker who remarked that it is an interesting fact that, in the United States, where the bulk of experience of natural gas so far lies, natural gas can now account for as much as one-third of the energy produced by very many of the major oil companies. Also, those oil companies who do produce gas in the States, but do not participate in the transmission of it over long distances or in its distribution to gas users, receive for their effort of producing gas (which accounts for a third of the overall tonnage they produce) a return which is very small indeed. It is a rough indication, taking gross revenues, that the gas, which represents about one-third of the calorific value of what they produce (gas+oil), when sold by many of these oil companies brings in only a mere two or three per cent of the total receipts from sales of natural gas, crude oil, and petroleum products. It seemed to him that an analagous situation will arise if and when liquefied methane is transported by ship to markets in Europe and elsewhere for this gas to be distributed in them by gas companies. In other words, the oil industry, as in the United States, would inevitably be competing with itself and only get the gas producer's initial profit at its source where the gas is very cheap indeed. To give the subject some dimensions, it could be seen in the United States that the average retail price of gas was roughly four times the average well-head price. Moreover, in Venezuela or the Middle East, the prices of gas at the well-heads would be considerably lower than the 11, 12, or 13 or more cents a thousand cubic feet, which prices obtain in the U.S.A. Another speaker drew attention to the fact that liquid methane, to be transported from the Middle East, would have to pass through the Suez Canal and asked what attitude was being shown by authorities towards the possibility of such cargoes entering their ports. The author replied that such cargoes had been cleared by the Port of London Authority for entry into the waters under its jurisdiction and, in his opinion, what the P.L.A. would accept would be favourably received into other ports of the world.

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FIRST OIL DELIVERY BY DRACONE

What is believed to be the first commercial delivery of an oil cargo in a towed flexible vessel was made on 24 February. The vessel used was the prototype Dracone, D.1, built by Dracone Developments Ltd and which has been undergoing extensive handling and towing trials for the past six months in Southampton Water. It was described in the IP REVIEW in November last.

This voyage was made, with the kind co-operation of the Esso Petroleum Company Ltd, from its Fawley refinery on Southampton Water to its oil depot at Newport, Isle of Wight, a distance of about 10 miles. The cargo was 10,000 gallons of kerosine. The time taken each way on the voyage was under two hours, the speed when towing with a small 45 hp launch being 5 knots.

A compact self-contained pumping unit was used, consisting of a Petter P.C.2 diesel engine driving a Goodyear Size 12 pump, both on loan from their makers. The unit was mounted in the towing launch and emptied the Dracone in 65 minutes.

For their return journey, Dracones have previously been reeled and a towable reel is being developed. On this occasion, on being emptied the Dracone was allowed to flatten and sink. It was then connected to liquid carbon dioxide cylinders and inflated. An inert gas was used to prevent any possibility of fire risk from the generation of static electricity. The cylinders and equipment were kindly lent for this trial by Walter Kidde & Co. The carbon dioxide itself was supplied by the Distiller's Company.

Neither outward nor return journey presented any problems. There was a slight westerly breeze throughout the day.

This first operation was carried out in daylight, but with a tripod-mounted tri-coloured acetylene lamp towed astern it could be made in the hours of darkness. It was planned and controlled by Lt-Col. H. G. Hasler, D.S.O., O.B.E., R.M. (Rtd), the Company's operations manager, and further cargo deliveries will take place in the near future.

Great interest has been shown by British and foreign firms and by various official bodies, and further trials are to be conducted in co-operation with several major firms concerned with oil transport. Some will take place in British waters and two Dracones have been ordered for trials in West Africa.

A batch of Dracones of 10,000 gallon capacity is to be built within the next few months and will be available for sale. Delivery should take about four to five months from the date of order. The cost of these Dracones will be approximately £3300. The first 350-ton Dracone is also being built.

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AUSTRALIAN OIL SUPPLIES

The Petroleum Information Bureau (Australia) have recently published an interesting statistical booklet entitled *Oil and Australia—The Figures behind the Facts*, which in tabular form presents details of the country's oil imports, refinery production, consumption, and exports over the last few years.

Oil now supplies 35 per cent of Australia's total energy requirements, compared with less than 22 per cent in 1946. Imports in the 1957–58 fiscal year (July 1957–June 1958) totalled 2,808,814,000 gallons, of which 2,435,615,000 gallons, or 87 per cent, consisted of crude and enriched crude oil. The major categories of products to be imported were motor spirit, power kerosine, and lighting kerosine, in that order.

In 1947 Australia refined only about 11 per cent of its requirements of petroleum products. In 1957 about 85 per cent of the country's consumption was met by local refinery production. In 1947 total production was 94,650,000 gallons, ten years later this had risen to 2,231,506,000 gallons. Australian consumption of petroleum products in 1957, at 2,368,192,000 gallons, was more than three times that of 1946. Nearly half of the 1957 figure was composed of motor spirit and automotive diesel oil.

The nation's great increase in its refinery capacity has enabled some petroleum products to be exported. In the 1957–58 fiscal year this total amounted to 313,036,000 gallons, 70 per cent of which consisted of industrial diesel and furnace oils.

AUSTRALIAN OIL SUPPLIES IN 1957
1000 gallons

	Imports 1957–58	*Refinery production* 1957	*Consumption* 1957	*Exports* 1957–58
Crude and enriched crude oil	2,435,615	—	—	—
Aviation gasoline	26,583	14,914	44,316	49,582
Motor spirit	147,921	864,068	980,150	
Aviation turbine fuel	2,744	33,830	28,735	572
Lighting kerosine	46,866	9,981	54,956	6,143
Power kerosine	54,897	4,939	63,736	
Automotive diesel oil	20,250	170,638	165,278	32,168
Industrial diesel oil	7,447	276,959	227,023	220,878
Furnace oils		660,124	547,320 (b)	
Refinery fuel	—	133,845	133,845	—
Lubricants	39,505	8,192	51,569	NIS
Bitumen	NIS	46,164	44,220 (c)	NIS
Solvents	20,237	1,881	21,073	NIS
Liquefied petroleum gas (a)	—	177	177	—
Domestic gas (a)	—	5,794	5,794	—
Other products	6,749	—	—	3,693
Total	2,808,814	2,231,506	2,368,192	313,036

NIS — Not individually specified.
(a) — Fuel oil equivalent.
(b) — Includes naval consumption.
(c) — Estimated.

Britain's First Liquid Methane Import

The *Methane Pioneer*, jointly owned by the Gas Council of Great Britain and Constock International Methane Ltd, of the U.S.A., left the Gulf of Mexico on her voyage across the Atlantic with the first load of liquid methane ever to be carried by sea, on 31 January. She arrived on 20 February at Canvey Island, Essex, marking the completion of the first stage in an experiment which has attracted world-wide interest. It will obviously be necessary for three or four more trial voyages of this nature to be undertaken before the technical and economic possibilities of this project can be fully assessed. On arrival the load had still to be transferred to the holder tanks at Canvey Island, reconverted to gas, and taken by pipeline to the Romford works of the North Thames Gas Board for reforming before it can be mixed into the town's supply. But the voyage of *Methane Pioneer* has shown that it is technically possible for this gas to be transported over thousands of miles of ocean in liquid form at a temperature of *minus* 260° F.

The experimental load consisted of 2000 tons of liquid natural gas from one of the Gulf Coast oilfields. After liquefaction, which reduces its volume to 1/600th of the space occupied in gaseous form, it was loaded into five special tanks in *Methane Pioneer*. The tanks are aluminium, with a 12-inch insulation of balsa wood and an outer jacket of steel.

At Canvey Island a pipeline with a 6-inch covering of insulation leads from the jetty to the two main storage tanks, each of which has a capacity of 1000 tons of liquid methane. These tanks, which are the largest aluminium vessels ever to be built in Britain, were constructed respectively by the Whessoe Company Ltd and by the A.P.V. Company Ltd.

Although these shore storage tanks are heavily insulated there will be a continuous boil-off of gaseous methane from the liquid. This material will be contained in a small gasholder of the dry-sealed Wiggins type, whence it will be pumped into the mains system. Liquid methane will be vaporized by heat exchange with water or steam, and there is no intention at this stage of making use of the cold content or the refrigerating capacity of the methane. The liquid

Picture shows the 2000 *feet insulated aluminium pipeline,* 10 *inches in diameter, which conveys the liquid methane from the ship to the storage tanks*

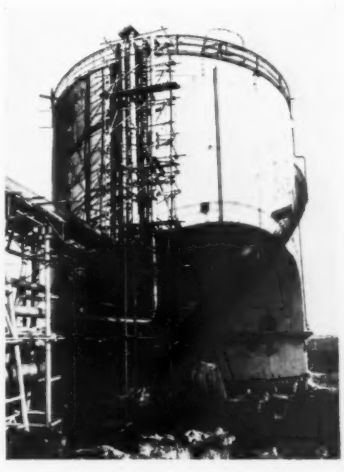
Methane Pioneer *alongside the jetty at Canvey Island*

methane will be converted to gas under pressure, and this pressure will be used to convey the gaseous methane into the Board's transmission lines. A new transmission line has been laid from Canvey Island to connect with a high pressure main already in existence between Shell Haven and Romford works, and the gaseous methane will mix with refinery gases from the Shell Haven refinery.

The town's gas supplied by the North Thames Gas Board is distributed at 500 Btu/cu ft, while the methane has a calorific value of 1000 Btu/cu ft. The reforming of the methane into gas of 500 Btu/cu ft will be carried out at Romford by the *Onia-Gegi* catalytic process.

The gas after reforming will have similar characteristics to gas normally produced from coal, and will be suitable in every way for consumers' appliances, with the added advantage that it will be free from sulphur.

Natural gas in its original state is estimated to have an equivalent of approximately 530 therms/ton. Allowing for losses during the conversion processes and during the voyage, it is estimated that the net value to the gas industry will be approximately 480 therms/ton. Therefore the equivalent capacity of the trial shipment of 2000 tons will be a little short of one million therms. It will be appreciated that this trial load is a comparatively small quantity in relation to the demand for gas. The North Thames Gas Board, for instance, produces over 400 million therms a year. If the trials prove successful, both from the technical and economic points of view, consideration will be given to the import of liquid methane on a much larger scale. It is thought that vessels carrying some 30,000 tons will probably be required in order to secure real economy.



One of the insulated aluminium tanks for storing the liquid methane at Canvey Island

Notes of the Month

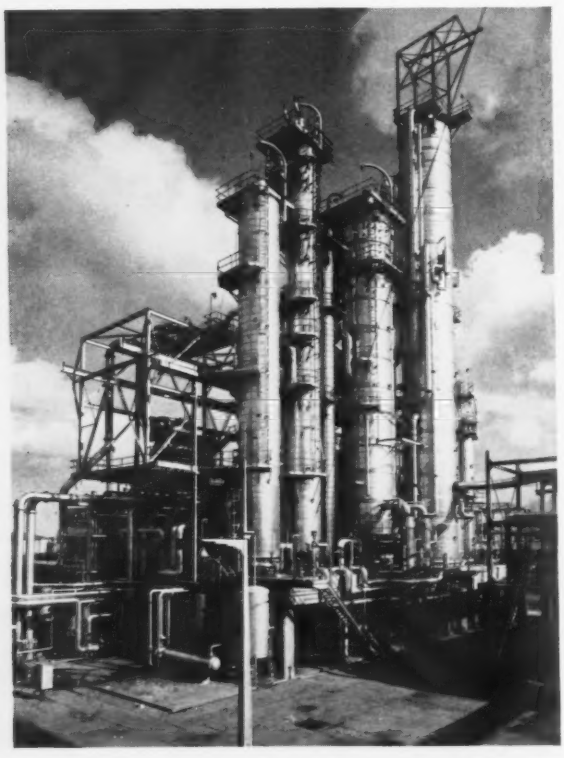
Shell Haven Crude Capacity Raised

A second crude oil distillation unit is now "on stream" at Shell Haven refinery, Essex. Costing, with tankage and ancillary equipment, approximately £6½ million, this unit has a daily capacity of 11,000 tons (80,000 b.d.) of Middle East crude oil, and its operation approximately doubles Shell Haven's distilling capacity to about 8 million tons/year.

The new Shell Haven distillation unit has two special features. First, a high degree of heat recovery is employed so that fuel consumption in the operation of the unit will be some 30 per cent lower than in previous designs. Second, a good recovery of light hydrocarbons is obtained by use of a large high-speed centrifugal compressor, which receives all the uncondensed streams and delivers them to the gas fractionating columns. The unit employs over forty centrifugal pumps, ranging from 5 to 450 hp, all electrically-driven and Buxton certified for Group II gases. Most of the pumps are fitted with mechanical seals. The one furnace employed is the largest single unit of its kind on any of Shell's U.K. refineries.

With the addition of Stanlow, Heysham, and Ardrossan refineries, Shell's total refinery capacity in the U.K. is now increased to some 15 million tons/year. The new installation unit was designed by Shell technologists in Holland, and was engineered and built by Messrs Stone & Webster Engineering Ltd, London.

The new distillation unit at Shell Haven



Shell Haven refinery began in 1916 with a single distillation unit on a 100-acre site. In those days an 8000-ton tanker could keep the plant working for a month. Development, which has been almost continuous since that date, was accelerated sharply in the post-war years when a complete new refinery was built to handle Middle East crude oil. In recent years further units have been added, including a £2½-million Platformer and a petroleum chemicals unit for the manufacture of alkyl benzenes.

Rocket Fuels Research

Esso Research and Engineering Company have announced the formation of a new unit to conduct advanced research in super rocket fuels under a contract awarded by the United States Advanced Research Projects Agency. The objective of this $1,264,000, initially one-year, contract, on a cost non-profit basis, is to develop improved solid propellants.

Esso Research and Engineering Company have appointed Dr John P. Longwell to direct the project. Dr Longwell, who contributed to rocket developments under a U.S. Navy contract held by Esso Research, will head a team of 25 to 30 scientists with supporting personnel as a separate unit within the Company. Dr J. J. Kolfenbach, who has been in charge of a basic research group in the Company, is assistant head of the project.

The Ownership of SONJ

Standard Oil Company (New Jersey), which began with less than 50 stockholders and 30,000 shares of stock in 1882, now has a half-million owners holding almost 215 million shares. Total investment in the company at the current market price exceeds $12,000 million, in contrast to the Company's original capitalization with $3 million in stock almost 77 years ago.

Jersey's shareholder list now includes about 450,000 individual investors, with the other 50,000 accounts being made up of estates and trusts, institutions, brokers, banks, and nominees of banks. More than half of the individual owners are small investors, holding fewer than 100 shares, and most of them live in the United States and its possessions. Employees of Jersey and its United States affiliates make up almost 10 per cent of the individual owners. They number about 42,000 or some 82 per cent of the Company's employees in the United States.

Jersey Standard's stock list has undergone dramatic growth in the past 10 years. In 1948, Company records listed 170,000 shareholders. Since then, both individual and institutional owners have more than doubled in setting the present record.

Commenting on the wide dispersion of the Company's securities, M. J. Rathbone, the president, said that no one individual holds as much as one per cent of Jersey's stock, while the biggest institutional holder owns only about three per cent. Jersey stock is also widely dispersed geographically. Registrations show that company investors live in some 75 countries and principalities, although almost 98 per cent of the outstanding shares are held by stockholders who have addresses in the United States and its possessions.

SONJ in 1958

A preliminary report released by Eugene Holman, chairman of Standard Oil Company (New Jersey), estimated consolidated earnings for the year 1958 at $564 million, or $2·73 per share based on the average number of shares outstanding during the year. Consolidated earnings for the year 1957 were $805 million or $4·08 per share. The preliminary results for 1958 are after provision for an increase in income taxes recently decreed by the Venezuelan Government effective from 1 January 1958. Although the books of the affiliates are not yet closed, the estimated effect of this increase in tax amounts to approximately $90 million. Apart from the impact of this tax increase, earnings in 1958 were depressed by lower average prices received for crude oil and petroleum products. Operating earnings in the last half of the year showed an improving trend, however, as volumes and prices firmed with the strengthening in general business activity. The rise in volumes during the fourth quarter brought sales levels to an all-time high.

Total revenues from sales and investments were estimated at $7705 million compared with $7978 million in 1957. Product sales volumes increased about five per cent over the previous record level attained in 1957. The decline in average price realizations, however, more than offset the effect of the gain in volumes.

Despite the decline in net earnings, income and operating taxes, together with import duties, consumer taxes, and other payments to the United States and foreign governments, again increased during the year. The total of such taxes amounted to $2343 million in 1958 compared to $2300 million in 1957. The 1958 payments were, in the aggregate, equivalent to $11·33 per share on the average number of shares outstanding, or more than four times the net earnings for the year.

The preliminary figures indicate that capital and exploration expenditures made by consolidated affiliates totalled about $1059 million in 1958. This compares with expenditures of $1377 million in 1957. Of the total 1958 outlay, approximately $851 million was for property, plant, and equipment, while other expenditures made in the search for oil and gas, and charged to current income, were $208 million.

Gross world-wide crude production in 1958 was estimated at 2,286,000 b.d. as compared with a record level of 2,389,000 b.d. in 1957. Refinery runs averaged 2,488,000 b.d. compared with 2,427,000 b.d. in 1957.

Petroleum Chemicals in Germany

Good progress is being made in the construction of the new petroleum chemical products plant for Erdölchemie GmbH at Dormagen, near Cologne in Western Germany. Erdölchemie is a jointly-owned company in which BP's German associate, BP Benzin und Petroleum A.G. and Farbenfabriken Bayer A.G. each have a 50 per cent interest.

The first unit of the new plant was completed last September. Construction is going forward on other units and the first stage of the new plant should be completed in the summer.

In keeping with progress on plant construction, Erdölchemie has raised its nominal capital from DM 50,000 to DM 87,500,000, BP and Bayer sharing equally in the increase. Under current plans total investment by Erdölchemie will exceed DM 300 million (£25 million).

Governor Visits Drilling Site

Sir Richard Turnbull, Governor of Tanganyika, recently visited the oil drilling site at Mandawa, where the BP-Shell Petroleum Development Company of Tanganyika is drilling for oil. The Governor is seen on the drilling platform in the accompanying photograph

Esso Education Grants

Grants totalling $528,630, to stimulate science teaching at 64 privately-supported colleges and universities throughout the U.S.A., were announced recently by the Esso Education Foundation. These grants represent the second part of a special three-year $1,500,000 programme intended to aid education in science and engineering.

The programme was established in 1957 as one of the activities marking the 75th anniversary of Standard Oil Company (New Jersey) and is separate from, and in addition to, the annual grants made by the Esso Education Foundation which have totalled more than $5 million since establishment of the Foundation in 1955.

Mobil to Build Terminal at Ellesmere Port

A new ocean-fed terminal, costing over £1 million, is being built by Mobil Oil Company Ltd at Ellesmere Port in Cheshire. Facilities will be provided for the storage and distribution of a full range of petroleum products. It is hoped to have the installation completed by the autumn.

The terminal is 2¼ miles from Queen Elizabeth II Oil Dock, at the entrance to the Manchester Ship Canal, from where ocean-going tankers and coastal vessels from Mobil's Coryton refinery will discharge their cargoes by pipeline to the new terminal. The storage capacity exceeds 23 million gallons and distribution will be made by road, rail, and sea. The purpose of the new terminal is two-fold: to offer a more efficient delivery service of petrol, diesel, and gas oils, and to permit for the first time the distribution of Mobil fuel oils in the north-west.

The area to be served forms one of the heaviest concentrations of population in the country. It contains 20 per cent of the total U.K. population and accounts for nearly 20 per cent of the country's consumption of petroleum products.

The main contractors are John Laing and Son Ltd, who as far as the mechanical and electrical work is concerned are in association with The H. K. Ferguson Company of Great Britain Ltd.

Tanker Evolution 1886–1961

Scheduled for launching in 1961, *a* 65,000 *dwt BP tanker the length of which will be* 815 *feet.*

ss. British Realm, *built* 1952, 28,598 *dwt, length* 643 *feet.*

ms. British Diligence, *built* 1937, 12,264 *dwt, length* 481 *feet.*

ms. Turicum, *built* 1928, 10,600 *dwt, length* 451 *feet.*

ss. Carpathian, *built* 1908, 7140 *dwt, length* 380 *feet.*

ss. Gluckauf, *built* 1886, 3000 *dwt, length* 310 *feet*

An artist's impression of tankers of various eras, from the Gluckauf, *prototype of the modern oil tanker, built in* 1886, *to the* 65,000*-ton tanker of today.*

Helium Tank-car Contract

A $1,959,000 contract for twenty special railway tank cars to transport helium gas produced by the Bureau of Mines, has been awarded to the American Car and Foundry Division of ACF Industries of New York City.

Delivery of the cars is to coincide with completion of the new helium-production plant at Keyes, Okla., next August. When the Bureau of Mines receives all tank cars now on order, it will have 163 in service, of which 25 will belong to the Atomic Energy Commission. All cars are used for shipping helium as they become available, regardless of ownership, so that the tank-car pool can operate as efficiently as possible.

Each of the new cars will consist of 30 seamless steel cylinders mounted with valves, manifolds, and safety devices in a steel framework on standard railway trucks. Each will weigh about 100 tons empty and, since helium is so light, only about 101 tons when fully loaded with more than 200,000 cubic feet of compressed gas.

Approximately 80 per cent of the helium now shipped by the Bureau of Mines goes by tank car, and this percentage is expected to increase in the future because this method is more convenient and economical than the small cylinders also used by the Bureau for shipping helium. One tank car can carry enough helium to fill 900 cylinders and on a typical trip of 1000 miles, transportation by tank cars costs the Government nearly $3000 less than the cost of shipment in individual small cylinders.

Mobilgas Economy Runs in 1959

A record number of Mobilgas Economy Runs, in which British cars did so well in 1958, are to be held in various parts of the world in 1959. Fifteen are planned, including six in Europe.

Last year British cars were declared outright winners in six of the 10 events held, in addition to gaining many successes in their individual classes.

Oil in New Guinea

A flow of oil at Puri, in November, 1958, raised Australia's hopes that the £A30 million spent upon oil search in Papua and New Guinea since 1912 might gain its reward, reports the *Quarterly Survey* of Australia and New Zealand Bank.

The establishment of oil refineries in Australia, states the Bank, has helped to reduce the cost of imports of oil, and to simplify the problem of supply in case of war. Nevertheless, both on the score of cost—crude oil cost Australia £A68 million in 1957-58, in terms of hard-won exports—and because of vulnerability of supply in wartime, there are sound reasons for stimulating oil search. Government encouragement is provided by grants for stratigraphic drilling, by tax concessions on subscriptions of capital to oil prospecting companies, and, in the event of oil being discovered, by exempting mining company profits from taxation until profits restore the capital expended in mining and treatment of petroleum.

The article points out that the resources already discovered would be of commercial value in less difficult and remote country for the major problem for the companies operating there has been transport.

Hungarian Oil Prospecting

Hungary plans to spend 430 million forints (£13 million) this year on its biggest-ever programme of oil prospecting, as against 350 million forints in 1958.

Nearly a million feet of deep drilling will be undertaken, one hundred and fifty new wells are planned, and production this year is expected to exceed one million tons.

The Hungarian oil industry suffered a set-back when flooding of the main oilfields at Nagylengyel began in 1955, and grew progressively worse in 1956, reducing production by 60 per cent in 1957.

Production in 1958 improved to 829,000 tons, 52 per cent of the 1955 figure of 1,601,000 tons.

Shell Chemical Plant for Australia

Following the recent opening of Shell's sulphuric acid plant at Geelong, Victoria, and their decision to build an *Epikote* resin plant at Clyde, Sydney, Shell Chemical (Australia) Proprietary Ltd are now to build a detergent alkylate plant at Geelong.

This plant, which will cost over A£1 million, is due for completion in early 1961. The production from the plant will, at full operation, represent an annual saving in foreign currency of over A£500,000.

The detergent alkylate is required for special applications in industry and by local soap companies for use in synthetic detergent powders which are increasingly supplementing traditional washing products in Australia just as they have done in North America and Europe.

Gas Council Licences for Commercial Plants

The Gas Council announces that it has entered into agreements under which Woodall-Duckham Construction Co. Ltd, Messrs Humphreys and Glasgow Ltd, and Messrs Henry Balfour & Co. Ltd, are licensed to build commercial plants at home and abroad. These cover a number of developments relating to the production of gas from coal and oil, which are characterized by operation under a pressure of several atmospheres.

This arises from the fact that much of the research work conducted by the Gas Council under the provisions of the Gas Act, 1948, has now reached a stage when it is ripe for commercial development.

Natural Gas in Germany

The production of natural gas in Western Germany totalled 343,838,000 cubic metres in 1958, according to *Erdöl-Informationsdienst* of Hamburg. This was a drop of 13·3 million cubic metres, or 3·7 per cent, compared to the 1957 figure of 357,126,000 cubic metres.

Drilling for Oil in New Zealand

Drilling of New Zealand's first oil exploration well since the war, was begun on 27 January at Kapuni near Hawera, in the Taranaki Province on the west coast of the North Island.

Shell BP and Todd Oil Services Ltd, after three years' exploration work, selected this location on a structure clearly defined by the seismic method. Planned to go to approximately 12,000 feet, the drilling is being carried out by a Shell crew using an Ideal 100 rig, Shell being operators for the joint venture of the Shell and BP Groups and Todd Brothers.

At an official spudding-in ceremony, the Minister of Mines, The Hon F. Hackett, threw in the clutch to start the rotary table.

Although the history of the search for oil in New Zealand dates back to 1865 (the first well in the country drilled for oil was started only six years after Colonel Drake's historic Titusville well), New Zealand's only oilfield is the very small field at New Plymouth, also in Taranaki Province, which produces some 900 tons per year.

New Zealand currently imports some 1½ million tons of petroleum products per year, about half of which is motor spirit.

New Deep Water Oil Terminal in the Arabian Gulf

Basrah Petroleum Company is shortly to start construction of a deep-water terminal at the mouth of the Shatt al Arab. To link the terminal with a new pump house at Fao some 24-miles away, two 32-inch diameter submarine pipelines will be laid.

Concurrently with the construction of the deep water terminal, the production facilities of the Zubair and Rumaila fields will be increased by drilling new wells at Rumaila, installing new degassing stations, and laying a new 30–32-inch pipeline from Zubair to Fao, with feeder lines from Rumaila to Zubair.

The cost of all these works, which will permit the expansion of oil exports from southern Iraq from 12 to 22 million tons a year, is £25 million.

Contracts for the construction of the terminal have been awarded to a group comprising The Raymond Concrete Pile Construction Company of Toronto, De Long Ltd, of London, and Richard Costain Ltd, of London. The contractor for the submarine pipelines is Collins Submarine Pipelines Overseas Ltd.

The project is due for completion early in 1961 and the accompanying artist's drawing shows how the terminal will then appear. It will consist of five platforms, the largest of which will be about 400 feet long and 240 feet wide. All five platforms will be supported on steel piles.

The provision of the deep water terminal will overcome the disadvantage to which Basrah crude is subjected by the inability of the Shatt al Arab to accommodate the larger tankers. The new terminal will be able to berth two 65,000-ton tankers simultaneously with a combined loading rate of 8000 tons/hr.

S.O.N.J. Forecasts Improvements in 1959

The improvement which took place in the business of Standard Oil Company (New Jersey) in the second half of 1958 is expected to continue into 1959, Eugene Holman, Jersey Standard board chairman, said recently.

The prospect of an increase in U.S. demand for petroleum, together with a rising demand in other free world areas, made the near future outlook more optimistic than at the end of 1957.

"We expect that a continued rise in general business activity will result in a new high for petroleum demand in the United States, possibly amounting to about five per cent over 1958. In the rest of the free world, too, the industry growth rate should accelerate, and we are looking there for about an eight per cent increase in 1959".

The confidence of Jersey Standard and its affiliates in the long-term growth prospects for petroleum energy was best expressed, Mr Holman pointed out, by the Company's programme in 1959 which called for about $1,000 million in capital expenditure for producing, refining, marketing, tankers, pipelines and for other expenditures in the search for oil and gas. This was about the same amount as spent in 1958 for these purposes.

About 42 per cent of the consolidated companies' 1959 capital expenditures programme would be in the United States; 32 per cent in Canada, Latin America, and other parts of the Western Hemisphere; and 26 per cent in free areas of Europe and other parts of the Eastern Hemisphere.

Turning to the oil industry's growth in 1958, Mr Holman said that petroleum demand in the United States was about two per cent over 1957. This growth resulted largely from recovery in the last half of the year from the general economic recession which began in 1957. In the other free countries, oil demand grew by about seven per cent in this period, a growth marked by the vigorous economic recovery in Europe from the Middle East crisis of 1956-57.

Mr Holman expressed confidence that the petroleum industry's expending research effort, now costing more than $300 million annually, would help enlarge the markets for the more than 2000 products made directly from oil. In the increasingly important field of petrochemicals, he reported that Jersey's research programme had developed a process for producing polypropylene, one of the most versatile of the new plastic materials, and a new synthetic rubber with advantages over both natural and other man-made types.

BP's Purchases

During 1958 BP Trading Ltd (BP's principal trading subsidiary) placed orders for materials, equipment, and services to the value of £14,500,000. Of this total, orders worth £13,623,000 were placed in the U.K., approximately 47 per cent of this amount being for export.

In addition, refineries and other main subsidiaries of the Company in the U.K. placed, during the year, orders valued at about £3,500,000 to cover their local requirements. Orders valued at £500 and over were divided among approximately 420 suppliers throughout the country.

Shipments of materials to overseas destinations by sea and air covered some 22,000 consignments amounting to 124,000 dwt, at a freight cost of just under £1,100,000.

Thermal Reformer on Stream at Kent Refinery

BP Trading Ltd have just placed on stream at their Kent refinery a thermal reformer designed by Kellogg International, London.

The 12,000 bsd thermal reformer is designed for single-pass thermal reforming of either light or heavy naphtha fractions from Middle East crudes, to produce a debutanized reformate of maximum research octane rating. The unit is also capable of handling platformates of similar boiling ranges.

Continuous operation of the unit for at least 2000 hours was an essential design requirement and in order to implement this two 6000 bsd reforming furnaces were provided.

The main tower of the unit separates the reforming furnaces' effluent into a heavy bottoms liquid and an overhead vapour product. The former is stripped of its lighter components to produce a fuel oil. The overhead vapour product, containing the reformate, is clay treated to remove undesirable polymers formed in the reforming reaction and then passed on for final fractionation in an afterfractionator, a debutanizer and, finally, a depropanizer. Debutanized reformate leaves the bottom of the debutanizer, the liquid overhead product of which is subjected to further fractionation in the depropanizer. Liquid butane, containing 90 per cent of all C_4 produced in the reforming furnaces, is taken from the depropanizer bottom. Initially, the depropanizer will be operated to produce a fuel gas as overhead product, but the design of this tower and its auxiliaries will permit future recovery of 70 per cent of the total propanes produced in the reforming furnaces as an unstabilized ethane-propane liquid product.

If desired, this wild liquid can be made into a propane LPG product by the future addition of a de-ethanizer and associated equipment.

New Bunkering Tanker

The *Esso Hythe*, an all-welded bunkering tanker of 1285 dwt, was launched recently from Scarrs Shipyard of Richard Dunstan Ltd, at Hessle, near Hull.

The vessel has been specially designed to give a high discharge rate to facilitate a rapid turn-round at ports and will also deliver fuel oil to several Central Electricity Generating Board power stations in southern England.

Ancient Ceremony Revived at Castrol House

The ancient ceremony of "Topping Out", which dates back to Roman times in England, was revived on one of London's newest and most modern buildings recently when the last skip of concrete was poured on the roof of Castrol House. The ceremony was performed by Leonard Broadway, managing director of the Wakefield Castrol Group, who congratulated the developers, The Hammerson Group of Companies, and the builders, Sir Robert McAlpine & Sons Ltd, on their work. The foreman of the builders then nailed up a green fir-tree bough and demanded a noggin of ale which was drawn and handed to him by Mr Broadway.

From ancient times it has been the custom to celebrate the fixing of the ridge-pole on the roof of a building, and in Roman times a human sacrifice was made "to placate the spirit of the timbers". The Anglo-Saxons replaced the human sacrifice by tying a green bough to the roof, and the noggin of ale was added to the "Topping Out" ceremony in the Middle Ages.

Oil India Private Ltd

Oil India Private Ltd, the agreement for the formation of which was signed by the Indian Government and the Burmah Oil Co. in January 1958, has now been registered as a rupee company.

The new company, which will take over the oil operations in the Nahorkatiya, Hugrijan, and Moran areas, will be owned by the Government of India and BOC, with a share-ownership of one-third and two-thirds respectively.

The Assam Oil Co. has so far drilled 48 holes in the areas in question, eight of them being dry and the rest oil producers. The proven and probable crude reserves are said to be sufficient to produce 2½ million tons a year after the completion of the pipeline and refining facilities.

The two refineries which will process the crude from these fields are to be owned by the Government of India, and will be located in Assam, and at Barauni, Bihar.

The board of directors of Oil India Private Ltd will be: W. P. G. Maclachlan (chairman), K. K. Sahni, Rana K. D. N. Singh, K. B. Kanuga, R. W. Wachter, and G. N. S. Robertson.

Record Drilling Depth in South Iran

The Iranian Oil Exploration & Producing Company's exploratory well, Ahwaz No. 6, has now reached a depth of 12,742 feet and is the deepest hole ever drilled in southern Iran. Drilling is continuing in the hope of an oil strike which might establish the existence of a new field.

Ahwaz No. 6 is the same well which on 19 April, 1958, was the scene of a spectacular fire when gas erupted from a depth of 8093 feet. Myron Kinley, the famous fire-fighter, arrived from the United States and led the 47-day struggle to get the well under control. After the well-site had been cleared a new rig was set up and drilling was continued.

U.S. Production of Helium

The U.S. Bureau of Mines, in their report for the 1958 fiscal year, reveal that although it achieved a record production of 340 million cubic feet of helium at its four plants during the year, this was not enough to meet demand. Anticipating the need for an additional plant to supply urgent defence and industrial requirements, the Bureau contracted for rights to extract helium from natural gas produced commercially in Oklahoma's Keyes field.

An intensive Bureau-Departmental study of the U.S.A.'s helium-supply position culminated in the broad new helium-conservation programme recently announced which envisioned up to 12 additional helium plants, to be built by Government or industry, and would permit recovery each year of approximately 3 billion cubic feet of helium now wasted when natural gas containing it was burned as fuel.

World's First Butamer Isomerization Unit

The world's first UOP Butamer unit will be installed by Standard Oil Company of California at its Richmond refinery.

The unit, which is licensed by UOP, will produce about 2000 b.d. of net isobutane by isomerization of normal butane, and the Butamer unit will use a fixed-bed catalyst having high activity. The isomerization reaction is carried out in a hydrogen atmosphere, employing moderate temperature and pressure. Volumetric efficiency of the process is "substantially 100 per cent" according to UOP. Estimated completion date for the new unit is June 1959.

New Catalyst Aging Units

At Esso Research Laboratories, Baton Rouge, new catalyst aging units make it possible to determine inexpensively the life of fluidized catalysts. The petroleum industry uses more than $40 million worth of catalysts each year. Catalyst life is a most difficult property to measure. Because operating conditions influence catalyst life very markedly, catalysts must be aged under the similar conditions, otherwise there is a danger that important variables affecting catalyst life and process economics will be overlooked.

The aging units consist of two captive fluid-bed reactors in which two different catalysts can be cyclically exposed to simulated process conditions. Recycle gas, feed, and regeneration gases are passed over the catalyst under conditions of temperature and pressure which can be controlled independently in each of the two reactors. The life of a catalyst therefore can either be determined simultaneously under two extremes of conditions, or alternatively, two different types of catalyst can be aged independently at the same time.

Catalyst aging unit

Several safety devices automatically check operating conditions during each cycle. Any operating condition which approaches the safety limits immediately triggers a shut-down, and the unit automatically flushes through with nitrogen.

Started up early this year, the plant has already determined the lives of about five types of new fluid catalysts under a variety of process conditions. Design principles supporting this plant are already being incorporated into new pilot plants now on the drawing boards.

Amphibious Aircraft in Pakistani Oil Search

A Catalina amphibious aircraft, specially equipped to record the rock strata under the sea bed while it taxies over the surface of the water, is now being used in the search for oil in the Bay of Bengal. This operation is being carried out by the Pakistan Shell Oil Company Ltd which has two concessions in East Pakistan, west of the Ganges, covering a total of 10,000 square miles, seven-eighths of which extends into the Bay of Bengal.

Marine seismic operations are usually undertaken from a ship, but off the Ganges delta the Bay of Bengal is too shallow for large ships and the turbulence of the seas is too great for small vessels.

The Catalina, an unorthodox but successful solution to the problem, is fitted with specially adapted seismic equipment which has been developed in a long series of tests by Shell experts in Holland and Pakistan.

Travel Grants to the U.S.A. for Businessmen

The English-Speaking Union announces the offer of three travel grants to the United States, application for which is open to businessmen of British nationality, normally resident and working in the U.K.

The basic aim of these grants is to enable people to travel widely in the United States, meet Americans in all walks of life and get to know something of that country's traditions, customs, and thought. The grant holder should then be equipped to relate this experience to his own work and community and should, from first-hand knowledge, be able to use his experience to the best advantage on return to the U.K.

The closing date for applications is 22 May 1959, and grants may be taken up between mid-September 1959 and the end of June 1960.

Each grant covers the cost of trans-Atlantic travel, extensive travel in the United States, and a daily subsistence allowance for each of the 56 days spent in the U.S.

Enquirers should mention the source from which they heard of these grants and the necessary special application forms are available from: The Secretary, The English-Speaking Union, Dartmouth House, 37 Charles Street, London, W.1.

The Association of Consulting Scientists

The formation of the Association of Consulting Scientists is announced. Its main purpose is to act as a clearing bureau for enquiries for independent scientific services. Membership of the Association embraces independent whole-time consulting scientists in the U.K. in all fields of science and technology other than medicine and civil, mechanical, and electrical engineering. The founder members are mostly chemists and biologists, but physics and other sciences are expected to have representatives in the new Association before long.

The new Association will operate in close collaboration with the Royal Institute of Chemistry and other professional institutes, and with other organizations concerned with the co-ordination of British efforts in research, production, and marketing.

The affairs of the Association are in the hands of an elected committee, having the following officers:—

Chairman: J. G. Davis, Ph.D., D.Sc., F.R.I.C., M.I.Biol.

Hon Treasurer: G. W. Ferguson, B.Sc., Ph.D., F.R.I.C.

Hon Secretary: W. H. Stevens, A.R.C.S., F.R.I.C., F.P.I., F.I.R.I.

Enquiries regarding the Association should be addressed to the Hon Secretary, at 15 Hawthorne Road, Bromley, Kent.

Increase in Australian Motor Vehicles

Since 1948 there has been a 130 per cent increase in the number of motor vehicles on Australian roads. A survey made by the Petroleum Information Bureau (Australia) shows a rise of from 1,104,000 vehicles to more than 2,500,000 vehicles in the ten-year period.

The average quantity of motor spirit sold per vehicle in a year was approximately 370 gallons in 1948, but consumption has now risen to approximately 410 gallons per vehicle per year.

OIL COMPANIES EQUIPMENT ORDERS

During the last quarter of 1958 orders for materials and equipment placed in the United Kingdom by oil companies were valued at £32,536,248, according to figures compiled by the Oil Companies Materials Association and issued by the CBMPE.

Total value of the orders for the quarter declined by £228,478 compared with the same quarter of 1957. There were decreases in value for the following groups: geographical and other exploratory equipment; specialized equipment for oil drilling and production (by 52 per cent); drums and can-making, filling and cleaning equipment, etc; tankage; tubulars, pipe-fittings, and valves; electrical equipment; ferrous and non-ferrous plates, sections, sheets, and bars; cement and other building materials, and hardware; and commissary and general requisites.

There were increases in all other groups, certain categories showing quite spectacular increases. Specialized equipment for oil refineries, etc; railcars, road tankers, and aircraft refuellers; and boiler and boiler house plant had increases of over 150, 300, and 600 per cent respectively. Full details are given in the table. The total for the whole of 1958 was £122,065,574, a drop of 9 per cent on the 1957 figure of £134,050,282.

	1958 *Oct.–Dec.*	1957 *Oct.–Dec.*
Geophysical and other exploratory equipment, etc.	19,854	21,836
Specialized equipment for oil drilling and production including oil casing, tubing, etc.	2,483,225	5,174,965
Specialized equipment for oil refineries, etc. (not including pumps and valves)	1,544,415	597,205
Drums and can-making, filling and cleaning equipment, kerbside pumps and other metering and dispensing equipment, etc.	193,854	284,402
Railcars, road tankers, aircraft refuellers, etc.	140,905	33,941
Drums, drumsheets, and tinplate ...	1,139,582	1,039,450
Tankage (including tank fittings) ...	750,401	1,544,585
Tubulars, pipe fittings, and valves (ferrous and non-ferrous)	3,754,922	4,752,690
Pumps, (excluding slush, oilwell, and kerbside)	623,332	418,736
Boilers, boiler house plant and accessories, etc.	432,019	59,433
Electrical equipment—motors, generators, transformers, etc.	2,409,627	2,578,857
Instruments, meters, and gauges, etc. ...	492,780	425,440
Prime movers and compressors... ...	1,215,207	694,035
Machine and hand tools, welding and miscellaneous machinery and stores...	2,815,520	2,501,524
Ferrous and non-ferrous plates, sections, sheets, and bars	1,396,637	1,856,882
Automotive equipment, all types ...	1,747,862	1,295,981
Laboratory equipment and chemicals including hospital and medical supplies	309,487	223,578
Bulk chemicals, catalysts, barytes, etc....	8,907,150	6,480,401
Cement and other building materials and hardware, including timber	790,490	1,117,518
Commissary, general requisites for office, warehouse, household, club and sports, etc.	1,368,979	1,663,267
	£32,536,248	£32,764,726

Around the Branches

ABADAN, BAHRAIN, ESSEX, FAWLEY, KUWAIT, LONDON, NORTHERN, SCOTTISH, SOUTH-EASTERN, SOUTH WALES, STANLOW, TRINIDAD, YORKSHIRE

Scottish Branch

At the meeting held in Edinburgh on 19 February Dr G. H. Smith, M.C., chairman of the Scottish Branch, presided and introduced the speaker, S. W. Cook, whose subject was "Coal Preparation".

Mr Cook said that coal preparation was the essential link between mining and marketing, and its degree and pattern had changed through the years. Machine mining had improved production but had given smaller and dirtier coal.

Market demand had also changed and over the past ten years the requirements of the coal conversion industries had risen by some 34 million tons per year. Large coal demand for railways and for domestic use was falling, but so was its production.

Since vesting date, some 209 new coal cleaning plants had been erected at a cost of £40 million. The percentage of coal mechanically cleaned had risen from 48·2 to 60·3.

Mr Cook gave data on laboratory tests of washability and described various washing processes. He concluded with a reference to present conditions in the mining industry.

At the conclusion of his talk, which was illustrated by a number of lantern slides, Mr Cook answered a considerable number of questions.

The meeting terminated with a cordial vote of thanks to the speaker on the call of the chairman.

Stanlow Branch

At the meeting of the Stanlow Branch on 21 January, the chair was taken by C. N. Thompson, Branch chairman. He introduced the lecturers, D. A. Caplin and G. W. Sears, both of Shell Petroleum Co. Ltd, who then presented their paper on "Operational Research and Electronic Computers".

Mr Sears, who opened the talk, pointed out that all computation was of course purely mathematical and in all problems a model of the real-life situation must first be built up, the information relating to this model fed to the computer, and the results interpreted.

In two small-scale over-simplified examples, Messrs. Caplin and Sears showed how a computer could be used to work out a most profitable gasoline blending programme and a least cost solution to a distribution problem, where three refineries were feeding five depots—the refinery production and the depot requirements being known.

Real life problems of similar type with up to 200 variables and a correspondingly large number of constraints have been solved in a matter of minutes, whereas by normal hand procedures some six weeks would have been taken to reach the same result.

A mathematical approach to the problem of siting refineries and depots was also illustrated. This was introduced as a development of the distribution problem previously discussed, the aim here being to minimize the sum total of the distribution costs in conjunction with the capital costs in plant and equipment.

The discussion was opened by B. Ashton of The Associated Ethyl Co. Ltd and continued in a very lively manner until 9.30 p.m. when a vote of thanks to the lecturers was proposed by the chairman.

There were 43 members and visitors present.

Bahrain Branch

The Forty-First Ordinary Meeting of the Bahrain Branch was held at the Awali Hall on 1 December 1958.

The speaker, J. M. Henley, of the Research and Development Department of the Bahrain Petroleum Company Ltd, presented his talk entitled "Some Applications of Digital Computers".

Mr Henley began by giving a brief description of digital computers, with particular reference to the Ferranti *Pegasus* model, and some operational research applications of computers were discussed.

From examples of conventional games which can be played by a computer the concept of a "mixed strategy" was put forward, leading to a discussion of the use, and solution, of game theory matrices. Natural extensions of this idea were then introduced, and brief descriptions of linear programming and transportation problems were given, with emphasis on the use of these techniques in the petroleum industry.

The application given most attention was that of the simulation of queues. It was pointed out that a queue, whether it be of tankers awaiting berth or equipment waiting for maintenance, costs money. Although it was possible to derive the probabilities of different queue lengths in the simple case of random arrivals and service times, the more complicated queues, or queue disciplines, which usually occur are more easily solved by Monte Carlo methods.

A computer programme for simulation of single-server queues, with such varied disciplines as customers arriving according to some observed distribution; impatient customers; speed-up of service; arrivals for appointments, with actual arrival time distributed around the appointed time, was demonstrated. Results from this programme were also shown, and it was pointed out how, in the case of random arrivals and service times, the programme results were close to the expected values.

After the speaker had quoted some cases of the use of queue simulation in the petroleum industry, and had summarized the main points, a general discussion took place.

A vote of thanks to the speaker was proposed by D. B. Bentley.

BP in the U.K. Petroleum Chemicals Field

The petroleum chemicals industry in Britain, as in most other countries, is almost entirely a post-war development. It is only eight years since the first plant in which The British Petroleum Company has an interest was commissioned at Grangemouth in Scotland. In that time one company alone, British Hydrocarbon Chemicals Ltd, in which BP has a 50 per cent interest, has invested nearly £20 million in British petroleum chemicals. The investment of other petrochemical companies with plant in the Grangemouth area substantially increases that figure.

The first petroleum chemicals units at Grangemouth came into operation in 1951. By cracking a petroleum spirit supplied by the refinery, the new plants produced two olefin gases, ethylene and propylene, and, as a first stage in their utilization, converted them into ethyl and isopropyl alcohols, which have many and various uses in the manufacture of chemicals.

Night view of the BHC plant at Grangemouth

In 1950 Forth Chemicals Ltd was formed to produce monomeric styrene, a chemical intermediate for the manufacture of the plastics material polystyrene, and for a number of other industrial uses. Plant was erected and was brought into operation in 1953. It has since been expanded to some four times its initial designed capacity.

Grange Chemicals Ltd was formed in 1955 and its plant, which is sited within the British Hydrocarbon Chemical area, was completed at the end of the same year and produces dodecyl benzene, known commercially as "detergent alkylate", an intermediate for the manufacture of high-grade synthetic detergents.

To meet the needs of these associates and to satisfy other demands, expansion of British Hydrocarbon Chemicals' plant became necessary, and during 1957 and 1958 new plant to duplicate the existing cracking and gas-separation plant for olefin production was commissioned. Ethylene manufacturing capacity is now at the rate of 60,000 tons a year. The greater part of this ethylene is used for the manufacture of industrial alcohol, the plants for which have also been substantially increased. Some ethylene is sold to Union Carbide Ltd for the manufacture of polyethylene in their Gemec factory at Grangemouth.

The liquefied product from a butadiene extraction plant, commissioned two years ago, is shipped to producers of synthetic rubbers and other polymers. Another plant which has not been long in operation by British Hydrocarbon Chemicals is a large catalytic polymerization unit, for the manufacture of propylene tetramer, one of the main feedstocks for the detergent alkylate which is manufactured by Grange Chemicals Ltd and others.

The three companies, British Hydrocarbon Chemicals, Forth Chemicals, and Grange Chemicals produced nearly 200,000 tons of chemical intermediates during 1958, in addition to high-grade motor spirit and other hydrocarbon by-products.

Work on new plant is going steadily ahead at Grangemouth. Synthetic phenol, which has a range of industrial uses, is to be manufactured on a large scale and the new plant, which is to be completed in the autumn of this year, will use a new process developed in Britain by The Distillers Company Ltd. Cumene will be made from benzine and propylene; in the subsequent conversion of cumene to phenol, acetone—an important industrial solvent and chemical intermediate—will also be obtained.

Good progress is being made with the British Hydrocarbon Chemicals project to make *Rigidex* low pressure polyethylene, which will be despatched from Grangemouth in pellet form for moulding into finished plastic articles. Construction work is proceeding and it is expected that the plant will be commissioned before the middle of this year. This plant will use the Phillips low pressure process for which The Distillers Company holds exclusive United Kingdom licence. The rated capacity of the new plant will be 11,000 tons a year.

Last autumn work was started on a third ethylene plant, to have a capacity greater than that of the two earlier plants combined. This will be the largest olefin plant in Europe and is due for completion in the middle of 1960. Its output will allow utilization plants, planned or existing, to be operated to full capacity and will provide a surplus on which continuing development can be based.

The cost of these projects will bring to over £33 million the capital assets of British Hydrocarbon Chemicals Ltd at Grangemouth.

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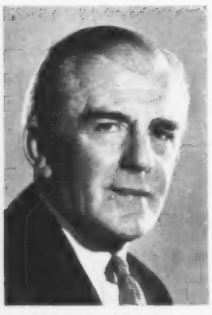
A Petrol Station Hibernates

Some of the service stations situated on the Swiss Passes of the Alps are only opened during the summer months. In the autumn, when the tourists have left the mountains, it is time for these service stations to "hibernate".

The hibernation process is shown in the pictures on the opposite page: the lonely service station is in use in the summer . . . but when winter comes the pumps are dismantled . . . everyone lending a hand . . . they are placed on sledges . . . and together with the lighting poles . . . are taken to the store for the winter

A Petrol Station Hibernates

Personal Notes



E. LeQ. Herbert

E. LeQ. Herbert F.Inst.Pet., has been nominated as president-elect of the Royal Institute of Chemistry for the years 1959-1961.

Mr Herbert, who is managing director of Shell Refining Company Ltd and a director of Shell Chemical Company Ltd, Trimpell Ltd, and Associated Ethyl Company Ltd, joined the Shell Group in 1927 as a plant chemist. He served for nearly twelve years in Mexico before returning to the U.K. in 1938 and was appointed to his present position in July 1955.

Mr Herbert is also a vice-president of the IP, a member of the Institute of Chemical Engineers, and the Institute of Fuel, an honorary fellow of the Heriot-Watt College and a Governor of the Battersea College of Technology. He takes office as president of the Royal Institute of Chemistry in April 1959.

The Royal Institute of Chemistry was founded in 1877. It was incorporated by Royal Charter in 1885, and took its present title on the granting of a second Royal Charter in 1949.

Dr Cecil Pepper

Dr Cecil Pepper, Ph.D., B.Sc., F.R.I.C., F.C.S., F.Inst.Pet., has been appointed managing director of Alexander Duckham & Co. Ltd. Dr Pepper joined the Company's Research Laboratories in 1936, became a director in 1941 and since 1952 has held the appointment of joint managing director.

Mobil Oil Company Ltd announce that **A. L. Lanckton** has been appointed a director of the Company with effect from 1 March in place of J. C. Dean, who has resigned.

J. H. Kirby has been appointed managing director of Shell Tankers Ltd, in succession to **A. S. C. Hulton.** Mr Hulton will be taking up another position in the Royal Dutch Shell group of companies.

Mr Kirby joined The Shell Petroleum Co. Ltd in 1930, and in 1937 went to the United States where he gained experience in a number of positions. He returned to London in 1952 and joined the board of Shell Tankers on the formation of that company in November 1953. Since July 1954 Mr Kirby has been deputy managing director to Mr Hulton.

A. Logan, O.B.E., has been appointed in succession as deputy managing director. He joined The Anglo-Saxon Petroleum Co. Ltd in 1927 and has been technical director since November 1955.

R. C. Chirnside, F.R.I.C., chief chemist of the research laboratories of The General Electric Company Ltd, Wembley, has been elected president of the Society for Analytical Chemistry. Mr Chirnside, who is 55, has been a member of the Council of the Society on a number of occasions since 1938 and was a vice-president in 1946–7, 1951–2, and 1957–8.

A. A. Bills, F.C.C.S., has been appointed secretary of the Motor Accessories Manufacturers Association in succession to Bernard Davies, who has resigned.

Associated British Engineering Ltd announce the following changes in group appointments:—

David Bruce, managing director of British Polar for 22 years, has now been appointed deputy chairman to the parent Company and will be responsible for the co-ordination of the whole of the Group's marine activities. He is succeeded as managing director of British Polar by **J. M. Watson,** who for the past four years has been works director. **R. H. Arnold,** general manager of British Polar, succeeds Mr Watson as works director. The Group's deputy chairman, **O. R. Guard,** becomes vice-chairman.

H. M. Currie

H. M. Currie has been appointed to the post of Marine Branch Manager in London for Mobil Oil Company Ltd, having held a similar post since 1951 in Newcastle-upon-Tyne. He joined Mobil in 1948, as a marine sales engineer in Glasgow, was educated at Clydebank and the Royal College of Science and Technology in Glasgow, where he obtained his National Certificate in Engineering. He served as an apprentice in the College laboratories and in the drawing office of Messrs Babcock and Wilcox Ltd, in Renfrew, prior to joining the Engineering Department staff of Messrs Wm. Denny and Bros Ltd in Dumbarton.

H. J. Elliott, the famous Australian athlete, has been awarded a scholarship by his employers, Shell Chemical (Australia) Proprietary Ltd. It is tenable this year at Melbourne University, where he will read first year's science subjects, and afterwards at Jesus College, Cambridge, where he will read natural sciences, commencing in October 1960.

In 1959 Elliott must also continue his studies in Latin to Leaving Standard, as this is a prerequisite to his acceptance at Cambridge.

The terms of Elliott's scholarship are the same as those regularly awarded to Shell staff in Australia since 1955.

H. Frank Jones, F.Inst.Pet., is now manager of the Marine Bunker Department of Esso Export Ltd. Previously he was with The British Mexican Petroleum Co. Ltd.

Sir William Scott, O.B.E., M.I.Mech.E., M.I.P.E., managing director of Armstrong Whitworth (Metal Industries) Ltd and **Sir Richard Bellingham Graham,** Bt, O.B.E., have been appointed directors of Head Wrightson Teesdale Ltd, a subsidiary company of Head Wrightson & Company Ltd.

Netherlands Honour for Englishman

At the Netherlands Embassy, London, on 5 February 1959, HE the Ambassador Baron Adolph Bentinck invested **W. F. C. Mackie,** C.B.E., B.Sc., F.Inst.Pet., formerly manager of Cardon refinery, Venezuela, and a member of the board of directors of Compania Shell de Venezuela, as an Officer in the Order of Oranje Nassau. Mr Mackie retired recently after 31 years service with the Royal Dutch/Shell Group.

In his citation the Ambassador commended Mr Mackie for the remarkable team spirit which he instilled in the men of many nations engaged in the development of Cardon refinery—now one of the largest in South America—and in fostering the harmonious Anglo-Netherlands relationship which has prevailed throughout. To his Netherlands colleagues he was known as the Burgomaster.

Mrs Mackie was presented with a bouquet of flowers by the Ambassador on behalf of the Dutch colony at Cardon.

A Shell Photograph

At the investiture ceremony, (left to right) *Jonkheer J. H. Loudon (a managing director, Royal Dutch/Shell Group), Mrs Mackie, Mr Mackie, HE The Ambassador, Paul Anthony, son of Mr Mackie*

S. H. Oliver

S. H. Oliver has been appointed assistant manager of the Wakefield Castrol Group Purchasing Department. Mr Oliver, who is 47, joined W. B. Dick & Co. Ltd. in 1932 and entered his present department when that Company became a member of the Wakefield Group some years later.

Jerry A. Cogan, a vice-president and director of Imperial Oil Company Ltd, Toronto, has been elected to the board of directors of Esso Research and Engineering Company.

Born in Colorado, Mr Cogan received a master of science degree from Massachusetts Institute of Technology in 1932. He joined the Jersey Standard organization in that year as a process engineer at the Esso Standard Oil Company refinery in Baton Rouge, Louisiana.

Mr Cogan was formerly head of Jersey Standard's Co-ordination and Petroleum Economics Department. He joined Imperial in 1944 as assistant general manager of the manufacturing department. In 1956, he was elected a director of the Company and in 1958 a vice-president.

The appointment of **T. J. Walne** as assistant manager of the International Division of Cameron Iron Works Inc., was recently announced. Mr Walne will assist J. H. Grubb, manager of the Division, in all phases of the Company's operations outside the United States. He has been associated with the oil industry on an international basis for a number of years. He will take over his duties at once and will be located at the general offices of Cameron Iron Works Inc., Silber Road, Houston, Texas.

Gordon L. Dray has been appointed manager of the Oil Division of the Consolidated Pneumatic Tool Company Ltd. He has been with the Company for over 21 years, and in 1951 joined the Oil Division. In recent years he has been associated with the supply of the Company's rotary air compressors to various countries and to many oil refineries in the U.K.

G. L. Dray

Dr Richard V. Hughes, an industrial petroleum engineer and former head of the department of petroleum engineering at Stanford University, has been appointed full professor of petroleum engineering at the Colorado School of Mines.

Dr Hughes has spent 25 years as a chemist and geologist for several petroleum companies, both in the United States and Venezuela. He became a visiting lecturer at Stanford in 1949 and shortly after that became head of the petroleum engineering department. In 1953 he became division reservoir engineer and technical adviser to the vice-president for the Gulf Oil Corpn, a position he held until his new appointment. He has written extensively on the subject of oil and gas recovery.

Lt-Col. S. J. M. Auld, O.B.E., M.C., D.S.C., Ph.D., F.Inst.Pet., announces his retirement from managerial and executive duties with Alco Products Export Co. Inc. He is succeeded by **S. D. Woolger.** Colonel Auld remains consultant to the Company and continues to operate from the Company's address.

F. Perkins Ltd, the Peterborough diesel engine company, announce several changes in its board, following the take-over of the Company by Massey-Ferguson (Holdings) Ltd. **Frank Perkins,** who has resigned his office of joint managing director, remains chairman, and **M. T. Prichard,** M.C., joint managing director, has been appointed managing director of the company.

Colonel W. E. Phillips, chairman and chief executive officer, and **Albert A. Thornbrough,** president, of Massey-Ferguson Ltd, Toronto, become directors following the resignation of Sir Richard Yeabsley, C.B.E., and G. P. Ritchie.

World Tanker Statistics 1958

Of the world total of 1936 vessels of 9,269,983 gross tons launched in the world in 1958, 429 were oil tankers, totalling 4,775,279 gross tons. This represented 52 per cent of the tonnage output for all classes of vessel, states Lloyd's *Annual Summary of Merchant Ships Launched in the World during 1958*, compared with 45 per cent in 1957. It was also a tanker tonnage increase of 924,578 over 1957.

Of the oil tankers launched 25 per cent were built in Japan, 13 per cent in the U.S.A., and 12 per cent in Britain. Japan led by a wide margin in both number and tonnage of tankers, with 131 vessels of 1,176,300 gross tons. The U.S.A. was in second place in terms of tonnage, with 643,994, but in number of vessels came after Germany who launched 92 compared with the U.S.A.'s 29. Germany's tonnage, however, was 491,562.

Both Britain and Sweden, with 48 ships of 577,385 tons and 31 of 521,451 tons, contributed a larger number of vessels than the U.S.A., but a smaller tonnage total. The British tanker figure was 41·2 per cent of all classes built in that country.

Liberia once again led the figures for country of registration, in terms of tonnage, with 50 tankers of 1,238,807 gross tons, Norway was second with 50 of 729,901 tons, and Britain third with 50 of 599,266. In the actual number of vessels Japan was easily the leading nation, with 96, Germany being the next with 52.

Details of countries of registration are given in Table I, and tonnages and country of build in Table II.

A particularly interesting fact with regard to the individual vessels launched in 1957 was the almost complete

TABLE I

REGISTRATION OF OIL TANKERS LAUNCHED IN 1958

Country of registration	*No.*	*Gross tons*	*Country of build*	*No.*	*Gross tons*
Britain ...	50	599,266	Britain... ...	36	396,265
			Belgium ...	1	21,000
			France... ...	1	22,000
			Germany ...	4	49,464
			Italy	3	69,000
			Netherlands ...	2	13,433
			Sweden ...	1	26,636
			Other countries	2	1,468
British Commonwealth	2	6,263	Commonwealth	2	6,263
Belgium ...	6	58,936	Britain... ...	2	23,760
			Belgium ...	1	13,066
			France... ...	1	21,400
			Germany ...	2	710
Brazil ...	2	25,838	Germany ...	1	4,747
			Netherlands ...	1	21,091
Denmark ...	11	173,733	Britain ...	2	45,300
			Denmark ...	7	102,565
			Japan	2	25,868
Finland ...	3	15,334	Germany ...	1	984
			Netherlands ...	2	14,350
France ...	12	214,518	Denmark ...	2	37,179
			France... ...	9	175,892
			Netherlands ...	1	1,447
Germany ...	52	127,864	Germany ...	52	127,864
Greece ...	1	42,500	U.S.A.... ...	1	42,500
Iran	1	21,000	Netherlands ...	1	21,000
Italy	11	164,129	Italy	11	164,129
Japan ...	96	233,500	Japan	96	233,500
Kuwait ...	1	28,500	Japan	1	28,500
Liberia ...	50	1,238,807	Britain	2	25,652
			Belgium ...	2	31,500
			Germany ...	5	89,606
Liberia—*cont.*			Japan	27	765,145
			Netherlands ...	3	46,581
			Sweden ...	3	53,317
			U.S.A.... ...	8	227,006
Netherlands	19	86,475	Germany ...	14	15,722
			Japan	1	21,400
			Netherlands ...	4	49,353
Norway ...	50	729,901	Britain... ...	5	67,658
			Denmark ...	2	25,496
			France	1	13,300
			Germany ...	10	174,088
			Netherlands ...	5	75,549
			Norway ...	15	179,596
			Sweden ...	12	194,214
Panama ...	13	313,244	Britain... ...	1	18,750
			Italy	4	85,025
			Japan	4	101,887
			Sweden ...	1	26,450
			U.S.A.... ...	3	81,132
Peru	1	4,297	Other countries	1	4,297
Portugal ...	1	17,557	Belgium ...	1	17,557
Russia (U.S.S.R.)	3	9,990	Finland ...	3	9,990
Spain ...	7	72,810	Spain	7	72,810
Sweden ...	18	283,311	France... ...	1	22,050
			Germany ...	2	27,727
			Italy	1	12,700
			Sweden ...	14	220,834
Switzerland ...	1	650	Germany ...	1	650
U.S.A. ...	17	293,356	U.S.A.... ...	17	293,356
Yugoslavia ...	1	13,500	Yugoslavia ...	1	13,500

Of the 429 tankers launched, 273 were for registration in country of build.

predominance of oil tankers amongst the largest vessels. In Britain the ten largest ships launched were all tankers, and for the world as a whole the top eight in size were of that category, the largest being of 69,100 tons.

TABLE II

OIL TANKERS OF 100 TONS AND UPWARDS LAUNCHED IN 1958

Country of build	*Steam*		*Motor*		*Total*	
	No.	*Tons gross*	*No.*	*Tons gross*	*No.*	*Tons gross*
Great Britain & N. Ireland	23	416,874	25	160,511	48	577,385
Canada ...	—	—	2	6,263	2	6,263
Belgium ...	3	57,057	2	26,066	5	83,123
Denmark ...	—	—	11	165,240	11	165,240
Finland ...	—	—	3	9,990	3	9,990
France ...	9	205,567	4	49,075	13	254,642
Germany ...	18	353,082	74	138,480	92	491,562
Italy	12	270,250	7	60,604	19	330,854
Japan ...	39	1,045,166	92	131,134	131	1,176,300
Netherlands ...	8	150,479	11	92,325	19	242,804
Norway ...	2	33,904	13	145,692	15	179,596
Peru	—	—	1	4,297	1	4,297
Portugal ...	—	—	2	1,468	2	1,468
Spain ...	—	—	7	72,810	7	72,810
Sweden ...	3	78,086	28	443,365	31	521,451
U.S.A. ...	27	642,094	2	1,900	29	643,994
Yugoslavia ...	—	—	1	13,500	1	13,500
World total	144	3,252,559	285	1,522,720	429	4,775,279

* * *

Books and Films

Fawley Foundation Lecture

The fifth Fawley Foundation Lecture was delivered by Sir Harry Pilkington on 6 November 1958, at the University of Southampton.

The text of the paper, "Facing the Future of Industry", has now been published, price 2*s* 6*d*. Under this heading a number of important general problems which face industry now and in the future, as a result of scientific progress, are discussed. Within the framework are included such topics as industry in the underdeveloped countries, the freeing of trade, the pressure of capital, and size and inflexibility.

Pipeline Industries Guild

A pamphlet has been issued by The Pipeline Industries Guild which describes, for the benefit of potential members and others, what the Guild is and aims to do, as well as showing who is eligible for membership.

Among the objects of the Guild are the promotion and development of the science and practice of pipeline design, construction, and operation; the facilitating of exchange of ideas with regard to pipelines; and to promote research and development.

Those interested in membership of the Guild, which may be Individual or Corporate, should write to The Secretary, Mrs M. H. Shields, 7 Iddesleigh House, Caxton Street, London, S.W.1.

Prices of Petroleum Products

A booklet entitled *World Retail Prices and Taxes on Gasoline, Kerosine, and Motor Lubricating Oil* has been published by the U.S. Bureau of Mines, as in former years. The tables included show the relevant information on this subject for representative cities in various countries of the world during or about the period July-September 1958. All values are expressed in cents per U.S. gallon at the rate of exchange operating at the time, and the products are given according to grades, with duty and tax details included.

1958 Book of the Year

The emphasis in Shell-Mex and B.P.'s 1958 *Book of the Year* is on *people*. Not only the thousands of people who work for the Company itself, but the many more who are part of the countless industries which in the past year have been using more of the Company's products than ever before. The Company, calling its publication "a book about people—for the people who made it possible", pays tribute within its pages to all those who have brought the year's achievements to fulfilment, both for the Company and for Britain itself.

Out of these many industries, closely inter-dependent with the operations of the petroleum marketer, three—fishing, railways, and glass—are chosen as examples of them all.

Among the more important events in the progress of Shell-Mex and B.P. itself in 1958 was the introduction of the *Aladdin Pink* kerosine delivery information service, to deal with telephone enquiries resulting from television and press advertising. Important too, was the part played by the Company in the supply of fuel and lubricants for the construction of the London-Birmingham motorway and for the initial stage of the Maidstone by-pass. The increases in sales of the various petroleum products are also highlighted.

Nevertheless, what might be judged the most impressive and abiding memories of the book are such items as the illustrated account of the work of the trawlermen; the crew hauling aboard a gashed and empty trawl; the arctic trawler with its potentially deadly coating of thick ice; and the face of the skipper who has spent most of his working life in arctic waters.

These, together with the scenes of the locomotive works, and the furnaces in the glass factory which go to fashion the material which may end in such products as the optical pyrometer to measure the temperature of the self-same furnace, are some of the visual attractions of this book. These are expertly woven together by a text that lightly, and with the accent on personalities, tells of the achievements of the industries concerned.

BP Operations in 1958

The British Petroleum Company Ltd have issued the latest of their annual pictorial reviews of the Company's activities. *News in Pictures* 1958, in the space of forty-odd pages, covers such special items in the BP year as its contribution to the Trans-Antarctic Expedition, the offshore drilling and discovery of oil at Abu Dhabi in the Persian Gulf, the expansion of the Kuwait refinery, and the first export of Nigerian oil. In addition further illustrated pages show the work of the Group in the every-day but nonetheless important, fields of research, petroleum chemicals, aviation, fuelling, ship's bunkering, tanker and tanker terminal construction, and many other facets of the multitudinous activities that go to make up the work of a world-wide integrated oil company.

Basic Electricity and Electronics

A new course manual of technical training in *Basic Electricity—Basic Electronics* has recently been published in Britain.

The first five volume parts are concerned with basic electricity, and present the essentials of a course devised some years ago at the request of the U.S. Navy, since when it has been used extensively by many schools and technical training institutions.

The manuals have been adapted to British usage and terminology, with War Office approval, by a special training team of the REME, and have been adopted as a basic text for the training of future army technicians.

The manuals are simply and clearly written, carrying at least one diagram or cartoon-type illustration on every page, and conduct the reader in careful and logical progression through what can be an extremely perplexing subject. They should be welcomed with gratification by the intending student who may understandably find the usual text-book on electricity tortuous and unimaginative.

The second part of the course manual, *Basic Electronics*, is in six volume parts and is identical in style.

The authors of the course, Van Valkenburgh, Nooger & Neville, Inc, are a well-known New York firm of management consultants and specialists in method engineering. The price of the books is 12*s* 6*d* net per part, or 55*s* net per set. A special price is available to schools and colleges and for apprentice training schemes. Publishers are The Technical Press Ltd, 1 Justice Walk, London. S.W.3.

Chemical Engineering in Europe

The European Federation of Chemical Engineering has published its 1957 *Annual Report*. Part I of the report deals with the Federation as such, and the expansion of the Scientific Advisory Council is of particular interest.

Reports from member societies are given in Part II. This section of the book reviews the wide range of activities in the field of chemical technology, chemical engineering, and process engineering covered by the technical and scientific societies belonging to the European Federation of Chemical Engineering.

Part III provides a survey of the research institutions in Europe which are concerned with the field of chemical engineering, process engineering, and chemical technology.

The report may be obtained from the General Secretariat of the European Federation of Chemical Engineering, Frankfurt (Main) Office, DECHEMA, Rheingau-Allee 25. The price for members of societies affiliated to the Federation is DM 15, (the name of the applicant's society should be given when ordering), and for non-members DM 30.

Technical Dictionaries Catalogue

A new edition, for 1958, of *Bailey's Technical Dictionaries Catalogue*, has been published by Bailey Bros & Swinfen Ltd. The catalogue presents a list of technical dictionaries published in many countries on an exceedingly comprehensive range of technical subjects. Among the 180 or more subjects covered are chemistry, commerce, economics, fuels, geology, and petroleum. The catalogue is free of charge from the publishers at Hyde House, West Central Street, London, W.C.1.

Scientific Research in Schools

In order to assist school masters and mistresses who wished to pursue research work in science, the Council of the Royal Society established in 1957 a Committee on Scientific Research in Schools.

The Royal Society has now published a statement concerning the project and giving details of the very favourable response encountered. Schools at which research projects are being carried out or are under consideration are listed, as are the subjects of the various projects in progress currently. The subjects include solubility of common gases in hydrocarbons; glacial lacustrine deposits in Derbyshire; hydrocarbon oxidation and amines.

One of the members of the Committee appointed in 1957 was Dr C. G. Williams, director and general manager of "Shell" Research Ltd.

Consideration is now being given to placing under the aegis of the Committee the research projects at present assisted by "Shell" Research Ltd.

European Federation of Corrosion

The Annual Report for 1957 of the European Federation of Corrosion has now been published.

The development of the Federation, an association of European technical and scientific societies concerned with research on corrosion and the protection of structural materials, has continued satisfactorily during 1957.

Part I of the report deals with the work of the Federation as such. A further expansion of the Scientific Advisory Council, which consists of one or two outstanding experts from each of 10 European countries, is of particular interest.

The reports from member societies are given in Part II. This section gives a review of the many-sided activities of technical and scientific societies in Europe, which includes practically all branches of corrosion research and the protection of materials.

Part III of the Annual Report provides a survey of the research institutes in Europe which are engaged in this sphere of activity. A particularly useful task has been accomplished by the Federation in compiling this survey which covers a wider field than in 1956.

The report may be obtained from the Frankfurt office of the General Secretariat of the European Federation of Corrosion, Frankfurt (Main) 7, Postfach. The price is DM 15, plus forwarding charges, for members of societies affiliated to the European Federation of Corrosion (the name of the society should be given when ordering), and DM 30 for non-members.

U.S. Motor Gasoline Survey

The U.S. national survey of motor gasoline for the summer of 1958 is now available. *Petroleum Products Survey No. 8: Motor Gasolines, Summer* 1958, is published by the Bureau of Mines, U.S. Department of the Interior, Washington.

Analyses of gasoline samples collected in this nation-wide survey showed that the average regular price gasoline in the period under review had a research octane rating of 90·2, whilst premium and super-grade gasolines averaged 98·4 and 101·4 respectively. For the first time in the history of the survey, the Bureau says, a premium price gasoline reached or passed the 100-octane level, for the highest rating recorded for that grade was 101·3.

The study points out that in the summer of 1948 the octane ratings averaged 80·1 for regular grade, 86·1 for premium, whilst no super-grade gasolines were sold ten years ago.

Copies of the report can be obtained from Publications-Distribution Section, Bureau of Mines, 4800 Forbes Ave., Pittsburgh 13, Pa.

Research Summaries

In order to help firms with engineering interests to keep in touch with results of recent research which are of direct industrial interest, the Mechanical Engineering Research Laboratory of the DSIR is publishing short pamphlets entitled *MERL Research Summaries*. These single-page leaflets describe the research that has been undertaken, list further sources of information on the subject, and where relevant, give the manufacturers of the apparatus concerned.

Summaries already published are concerned with: measuring the air content of oils; the strength of pin-joints; measurement of large water flows; world literature on heat transfer; and the design of hydraulic relief valves.

Copies of these summaries may be obtained singly or as a regular order, on application to the Mechanical Engineering Research Laboratory, East Kilbride, Glasgow.

Further details of the range of the Laboratory's work are given in the *MERL Brochure*, which is also available on request.

Petrofina News

The latest issue of the house magazine of Petrofina (Gt. Britain) Ltd—*Fina News*—includes articles on the management structure of the Company, and a survey of the pioneering activities of the Petrofina Group in various aspects of petroleum operations.

British Standards

Dimensions of ball bearings and parallel-roller bearings

This revised publication, BS292: 1958, relates to those features which control the interchangeability of bearings as units; it does not deal with their internal dimensions or detailed design.

Dimensions are specified for single-row, angular contact, and double-row journal bearings; for rigid, parallel-roller, journal bearings; for snap-ring type ball journal bearings; for magneto bearings; and for single-thrust bearings with flat seatings and with spherical seating rings.

Copies may be obtained from the BSI, price 12*s* 6*d*, (postage extra to non-subscribers).

Code for the continuous sampling and automatic analysis of flue gases: Indicators and recorders

BS 3048: 1958 has been prepared at the request of the Ministry of Power to assist in raising the general level of combustion efficiency in industry, and deals with automatic instruments which give a direct indication or record of flue gas composition.

The main body of the code deals separately with thermal conductivity instruments; instruments depending upon chemical absorption and chemical reaction; viscosity and density instruments; and with gas analysis instruments of recent origin. In addition there are sections on determination of dew point, and on kindred subjects such as dust and smoke testing, smoke density indicators and alarms, etc.

Copies may be obtained from the BSI Sales Branch, 2 Park Street, London, W.1. Price 15*s* (postage extra to non-subscribers).

The Work of the Civic Trust

The Civic Trust has recently released four publications of importance and interest to those concerned about the increasing spread of industrial and commercial ugliness across the face of Britain—the relentless encroachment of what is known as "subtopia."

The Trust itself seeks primarily in the words of Sir Howard Robertson, past president of R.I.B.A. and one of the Trustees, to open people's eyes to the squalors and splendours of their environment, to make people more aware of the problems posed by development in town and country, and to bring together those with specialist knowledge of architecture, planning, and civic design, so that the problems may be studied and the solutions properly publicized. Among its trustees are Duncan Sandys, the Minister of Defence, the president of the Trust, The Archbishop of Canterbury, Sir Edward Spears, and C. M. Vignoles. Its list of patrons include a score of prominent men and societies, from the presidents of the Royal Academy, various city Lord Mayors, and Viscount Chandos, to RIBA, The Royal Institution of Chartered Surveyors, and the Institutions of Civil and Municipal Engineers.

Of the four booklets mentioned, *The Civic Trust* is a paper on the first year's work, presented by Sir Howard Robertson, and which explains the aims and objects of the Trust. *Your Town* gives an outline of how local bodies of people who wish to prevent the spoiling of their district can form themselves into an amenity society. The amenity awards presented by the Civic Trust to further their objects of encouraging tasteful building and scenic development are described in the third pamphlet, and the fourth, *Who Cares*, gives details of four BBC television films produced in collaboration with the Civic Trust to try and make people aware of the problem and to awaken their interest in their surroundings.

It is to be hoped that these publications and films will go far to achieving the latter aim. The Civic Trust is doing work of vital social and cultural importance in Britain. May their efforts achieve success and jolt many out of their apathy, whilst diverting some of those engrossed in the attainment of other worlds, back to the more important necessity of maintaining the beauty of their own.

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Middle East Oil Production

	January Tons
Iraq Petroleum Co. Ltd	2,138,146
Basrah Petroleum Co. Ltd	1,055,077
Mosul Petroleum Co. Ltd	111,411
Qatar Petroleum Co. Ltd	658,310
Iraanse Aardolie Exploratie en Productie Mij ...	3,404,000
Kuwait Oil Co. Ltd	5,882,347
	Barrels
Arabian American Oil Co. (Saudi Arabia) ...	30,812,813
Bahrain Petroleum Co. Ltd	1,410,973

The refinery throughput at Abadan of the Iraanse Aardolie Raffinage Mij for January was 1,190,000 tons.

Crude processed at Aramco's Ras Tanura refinery during January was 5,127,052 brl.

Oil deliveries from Sidon, Lebanon, by the Trans-Arabian Pipe Line Co. in January were 11,745,049 brl.

Lectures, Courses, and Exhibitions

Management Courses

Management courses arranged in London by Osmond Turner during the next two months cover a variety of subjects. They are as follows:

The Personal Skills of Management—3 days, 22–24 April, 25–27 May, 17–19 June.
How to Improve Meetings Within the Organization—3 days, 1–3 June.
How to Improve the Writing Within the Organization—3 days, 11–13 May.
Talking with People—2 days, 21–22 May.
Clear Thinking—2 days, 16–17 April, 8–9 June.
The Personal Skills of the Trainer—3 days, 29 April–1 May.

Details and syllabuses are obtainable from Osmond Turner, 1–3 West Street, London, W.C.2. ('phone: COVent Garden 0481).

Factory Equipment Exhibition

Advice on the technique of oil-firing will be given by Shell-Mex and B.P. staff at the Factory Equipment Exhibition, Earls Court, 7–17 April.

Test equipment used by the Company's fuel efficiency officers in advising factories on the operation of their oil-fired plant will be shown. A new departure in the shielding and lagging of steel chimneys will be displayed.

Each day a film strip will be shown illustrating the use of oil in smokeless zones and the applications of the Clean Air Act.

Mechanical Handling Exhibition

Arrangements for the next Mechanical Handling Exhibition and Materials Handling Convention which will be held at Earls Court, London, from 3–13 May 1960, are now in hand.

The scope of the last Exhibition, in 1958, was widened to include international exhibits, a change which met with universal approval as it enabled the thousands of visiting buyers to compare the products of the various countries.

Organized every other year by the journal *Mechanical Handling*, the Exhibition embraces every type of equipment for saving time and expense and for aiding labour in virtually every industry.

Full information can be obtained from the organizer, H. A. Collman, Mechanical Handling Exhibition, Dorset House, Stamford Street, London, S.E.1.

Congress on Occupational Health

The 13th International Congress on Occupational Health is to be held on 25–29 July 1960 in New York City. Subjects to be covered will include administrative methods, medical and surgical practices, education and training, social and legal aspects, work physiology and psychology, environmental factors in health, environmental hygiene, and hazards of specific industries.

Further information on the Congress, can be obtained from Dr Robert E. Eckardt, Secretary-General, P.O. Box 51, Linden, New Jersey, U.S.A.

Those desirous of presenting papers on any of the subjects listed should write to Dr Irving R. Tabershaw, Chairman of the Scientific Programme Committee, International Congress on Occupational Health, 375 Park Avenue, New York City, U.S.A.

Air Pollution

The next annual meeting of the Air Pollution Control Association will be held on 22–26 June 1959, at the Hotel Statler, Los Angeles. The meeting will include technical sessions and exhibits.

At the technical sessions papers will be presented by leading authorities on the subject of air pollution control, and the exhibits will include the latest equipment designed for this purpose.

Copies of the papers will be on sale during the meeting and afterwards the Proceedings will also be available. Further information should be obtained from the Association, at 4400 Fifth Avenue, Pittsburgh 13, Pa, U.S.A.

The Treatment of Waste Waters

The Public Health Section of the Department of Civil Engineering of King's College, University of Durham, is holding a "Symposium on the Treatment of Waste Waters" on 14–19 September 1959.

The papers to be read at the symposium include the following:

"Some Aspects of the Biochemistry of Anaerobic Digestion."
"Ecology of Activated Sludge and Bacteria Beds."
"Process Design of Biological Oxidation Systems for Industrial Waste Treatment."
"The Application of Recirculation to the Purification of Sewage and Trade Wastes."
"The Treatment of Chemical Wastes."

Visits to the Dano composting plant at Edinburgh and the sewage-treatment plant at Hawick are included in the programme.

Pre-prints of the Symposium should be distributed about the middle of August and it is desirable, if these are to be adequately digested with a view to discussion, that application should be made before then and as soon as possible. The fee for the course is fourteen guineas, excluding accommodation, and is payable on registration. Applications should be made to Wastes Symposium, Public Health Engineering Section, Department of Civil Engineering, King's College, Newcastle-upon-Tyne 2.

Symposium on the Oxidation of Organic Compounds

On 13 and 14 April, in the Chemistry Department of Queen Mary College, a symposium on the Oxidation of Organic Compounds is to be held. The provisional programme lists contributions from leading authorities on this subject, including Professor N. M. Emanuel of Moscow, Dr Rocek of Prague, Professor F. H. Westheimer of Harvard, and Professor K. B. Wiberg of Seattle. Enquiries should be addressed to Dr W. J. Hickinbottom at Queen Mary College, Mile End Road, London, E.1.

Analysis of Plastics

A course of six lectures on plastics are to be held at the National College of Rubber Technology, Northern Polytechnic, Holloway Road, London, N.7., on successive Wednesdays beginning 29 April 1959. The fee for the course is £1 2s., and it is intended for those concerned in the application of recent developments in analytical techniques for plastics.

Symposium on Biomechanics

In a symposium arranged by the Institution of Mechanical Engineers, in London, on 17 April, on the subject of biomechanics, one of the four papers to be presented will be "The Lubrication of Animal Joints", by John Charnley, M.B., Ch.B., F.R.C.S.

This paper will have three appendixes, as follows:

"Derivation of an Expression for Friction Coefficient."
"Calculation of the Shear Rate in the Hip Joint Lubricant."
"The Lubricating Properties of Synovial Fluid."

The symposium will commence at 4 p.m., and the registration fee of 10s. includes tea and a set of the four papers. Admission is not restricted to members of the Institution. Registration forms may be obtained from the Secretary, at 1 Birdcage Walk, London, S.W.1.

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VISUAL AIDS AND THE BRITISH ASSOCIATION

In 1958 the Council of the British Association invited representatives of various organizations to serve with Council representatives on a Visual Aids Committee under the chairmanship of Sir Ben Lockspeiser.

At its first meeting the Committee requested the Visual Aids Officer to make a preliminary survey of visual aids in relation to the Young People's Programme, which exists to present science attractively and authentically to young people.

Many aspects of this problem were discussed informally with representatives of some fifty organizations—including learned and professional institutions, industrial organizations, educational bodies, scientific and visual aid journals, and visual aid producers and distributors.

The problem is a complex one. For example, more than 8000 schools have projectors. But are they used as effectively as they might be—indeed in certain circumstances are they used at all? Why do other schools lack such equipment? Films there are in abundance, but are they necessarily the right kind of films? How effective are the visual aids which do exist?

The British Association is already making use of all manner of visual aids, but such material is best used if carefully integrated with other activities. For example, it may be possible to arrange a programme of suitable films as one session in a course, but it is obviously much more effective if the director of studies and the lecturers have detailed information about the visual aids to be used and plan their material to link specifically with such aids.

If work of this kind is to be further developed more precise information is required about the contribution visual aids can make to the Young People's Programme. The British Association is, therefore, to make a detailed survey, the results of which will be published in a comprehensive report.

The completion of this report would not, however, mark the end of the survey. There must be a continuing activity if it is to provide regular information which will enable the sponsors and producers of visual aids in consultation with science specialists to provide material appropriate to ever-changing scientific and technological needs.

The full text of the article from which this information is extracted is published in the March issue of *The Advancement of Science*.

Trade Literature, etc.

Heat-Transfer Equipment

The Northern Aluminium Company Ltd, Banbury, Oxfordshire, have announced the production of a new type of solid aluminium sheet having internal systems of passages and ducts. Named *Noralduct*, it is particularly designed for heat-transfer equipment of all kinds, but has possibilities for use in other fields also. Sheets of *Noralduct* can be formed after manufacture, as are those used in refrigerator evaporator components, for example. It is said that the absence of joints minimizes the risk of leakages, and that since no flux is used, this source of possible corrosion is eliminated.

Electrofining Units

The Petreco Division of Petrolite Corp has announced the installation of the first *Electrofining* unit of entirely stainless steel construction. The precipitation unit will be used to remove the slurry from an aluminium chloride catalysed alkylation process, cutting caustic consumption and resulting in the production of a higher quality alkylate.

In addition the Division has designed a portable *Electrofining* precipitator to provide accurate pilot runs of on-the-spot treating capacities. The unit is approximately six feet in height, about 24 inches in diameter, and has a volumetric capacity of under 60 gallons.

Inert Gas Generator

The pipes, tanks, gas holders, and process vessels, used in the manufacture or handling of fuel gases need to be emptied from time to time. Before air can be let in, fuel gas must be removed. This needs a suitable inert purge gas.

In connexion with needs of this kind, the Dryer and Gas Plant Division of Birlec Ltd is at present engaged in designing an inert gas generator in which air mixed with propane is deliberately ignited within an enclosed cylinder, and the inert gases generated by the combustion are collected and employed in the purging process.

Auto-Klean Filters

Three new designs have recently been added to the range of self-cleaning filters for liquids, manufactured by Auto-Klean Strainers Ltd, Lascar Works, Hounslow, Middlesex. The filters, Auto-Klean 05C, 10GA, and 15JA, are designed primarily for lubricating and fuel oils, distillates, paints, and greases.

Hardfacing Process

Deloro Stellite Ltd, Highlands Road, Shirley, Solihull, Warwickshire, announce their new sprinkle fuse process for hardfacing with *Stellite* powder, developed in collaboration with Radio Heaters Ltd. The new process offers advantages where resistance to abrasion, corrosion, or heat, is necessary, by elimination of welding skill and the introduction of automatic heat control resulting in reduction in heating times and the more economic use of hardfacing alloys.

MAPEL

Metal and Pipeline Endurance Ltd have developed, and are now introducing, platinized titanium anodes for protection of condenser water boxes and internal protection of pipelines.

In the case of the condenser water boxes one anode is installed in each pass and fed from a rectifier through a control unit. In the case of internal protection of pipelines the anodes are installed at intervals, depending upon the pipe diameter.

The Company also announces that it has recently been appointed official consultants and cathodic protection designers for the Government of Trinidad and Tobago. The work will cover all types of new underground structures and pipelines for these islands.

Lubrication by Grease

An extremely useful illustrated technical publication entitled *Lubrication by Grease* has been produced by Germ Lubricants Ltd, Bloom Street, Salford, Manchester, 3.

This twenty-page booklet covers, in a comprehensive fashion, the characteristics and tests, selection and application, of the many varieties of grease.

Produced in an extremely readable style with explanatory photographs, the booklet sets out to assist the engineer in discriminating between the many diverse and complex greases in order to facilitate efficient lubrication of his plant machinery or vehicles.

New Liquid-Level Controller

Designed primarily to maintain a constant level in the fountain solution tray of lithographic presses, the new liquid level controller Model No. 614, manufactured and marketed by Liquid Systems Ltd, Norwich Union House, Wellesley Road, Croydon, can be used with all types of liquids wherever a constant level is required.

As all parts coming into contact with the solution are resistant to corrosive action, the flow to the tray cannot be restricted through eroded deposits and the frequent flushing of the feed is obviated. The unit is supplied complete with 5 feet of polythene tubing, two stainless steel hose connectors, and worm drive clips; a brass adaptor is also provided for brazing to the tray of the machine.

Prime Minister's Visit to Head Wrightson

The Prime Minister, the Rt Hon Harold Macmillan, and Lady Dorothy Macmillan, visited the works of Head Wrightson & Co. Ltd on 14 January. In a brief tour of the works the Prime Minister saw some of the major fabrications for the iron and steel industry and the giant heat exchangers for the Bradwell nuclear power station in course of construction, and made an inspection of the steel foundry.

The Prime Minister met the directors and senior management of the Company and spent some time with workers' representatives on the employees' council.

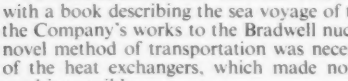
To commemorate the visit the Prime Minister was presented with a book describing the sea voyage of the heat exchangers from the Company's works to the Bradwell nuclear power station. This novel method of transportation was necessary because of the size of the heat exchangers, which made normal delivery by rail or road impossible.

Pump Performance

Two *LaBour G-type* vertical pumps have recently completed eight years' service with Williams (Hounslow) Ltd, Hounslow, Middx, handling works effluent which has a pH range of 3–12 before treatment. In these eight years the two pumps have handled 208 million gallons of this particular effluent, working 100 hours a week and being operated continuously, whilst still using the original casings.

Fawley Carbon Monoxide Boiler

The Fawley refinery of Esso Petroleum Co. Ltd is to have Britain's largest carbon monoxide boiler, designed, manufactured, and installed by Babcock & Wilcox Ltd.



This boiler will utilize the flue gases, rich in carbon monoxide, produced during the catalytic cracking process, to generate 300,000 lb/hr of steam at a pressure of 150 psi and a temperature of 465° F.

It will be of the circular, vertical type, surmounted by a steel chimney, with an overall height of some 250 feet, and will be used primarily to supply steam for the catalytic cracking unit. The boiler is to be equipped with combined Babcock *Multispud* gas burners and oil burners for employing a supplementary fuel supply of either fuel oil, or refinery gas, or both.

The oil burners will be used for starting-up and, combined with the refinery gas burners, generate the initial supply of steam to the cracking unit. As the throughput of the cracking process increases, the volume of carbon monoxide gas mixture increases, and the supplementary supply of fuel oil and or refinery gas is reduced, until a condition is reached when the ratio of supplementary fuel to carbon monoxide flue gas burned is in the proportion of one-third to two-thirds approximately. Under these conditions the boiler will operate at full capacity.

The Babcock carbon monoxide boiler will be a self-contained unit which not only recovers and burns the sensible heat and heat of combustion in the carbon monoxide flue gases from the catalytic cracker but can, when using only the supplementary supply of fuel, maintain a full steam supply to the refinery even when the catalytic cracking unit is shut down.

Portable Mixer

Premier Colloid Mills Ltd, Hersham Trading Estate, Walton-on-Thames, Surrey, have published details of their *Universal Mixer*, a portable machine in a stove-enamel finish and with a steel shaft available in various, easily interchangeable, lengths.

The basic unit comes in twenty-five variations of power and speed and can mix batches of up to 500 gallons.

Remote Control Systems

Dewhurst and Partner Ltd have issued a leaflet giving examples of their basic units which are available for remote control systems of all kinds—from a multi-floor passenger lift, or the control of a bank of motors, to a single instruction switch on an executive's desk.

Further information and a technical advisory service, is available from Inverness Works, Hounslow, Middlesex.

Direct-Injection Diesel

A new four-cylinder, direct-injection, diesel engine—the Perkins Four 270D—for boats, and agricultural and industrial equipment is announced by F. Perkins Ltd, who state that direct injection has now been sufficiently developed in small bore engines for it to be successfully employed in this type of medium-speed diesel power unit.

The Four 270D—the first direct-injection engine to be put into production by the Peterborough company—has the advantages of exceptionally low fuel consumption and easy starting in cold weather, and its features include the mechanically-governed, distributor-type fuel pump; a large-capacity lift pump; cast iron wet liners; and a low level camshaft with the maximum diameter between the cams to give rigidity.

Radiographic equipment

A new firm, R. F. Fraser-Smith, of 69 Kings Cross Road, London, W.C.1 (TERminus 1064 5), announce that they are able to supply radiographic equipment and accessories; in particular, they are manufacturers of gamma ray equipment, of a new design.

Contracting Department Formed

Winn & Coales Ltd announce the formation of a contracting department to carry out the protection of plant, pipe lines, structural steelwork, etc. For the present it will operate from their Northern Area Headquarters at Denso House, Glebelands Road, Sale, Cheshire.

Dealer Service Information

National Benzole Company have announced a new dealer information service for their garages and filling stations throughout the country.

This consists of the provision of "Service Information Sheets" giving details of all the latest cars.

These information sheets explain the location of such items as fuel-filling points, bonnet openings, batteries, dipsticks, spare wheels, and windscreen washer reservoirs. Tyre pressures, fuel tank, and engine oil capacity are also given. Each sheet contains photographs and diagrams to help the forecourt attendant.

As new car models come on to the market, National Benzole will provide appropriate information sheets to their dealers.

Gas Freeing and Corrosion Control

A new advance system of gas freeing, patented by Gotaas Larsen of New York, has been announced by F. A. Hughes & Co. Ltd, 4 Stanhope Gate, London, W.1.

The latter company, which has been appointed U.K. sales concessionaires, advise that this system is such that gas freeing can be undertaken under any weather conditions. Ambient temperature or preheated air is delivered through the normal cargo lines from a turbine blower located in the pump or engine room to any tank within the vessel. Compartments can be vented individually or all together.

Laboratory Furniture and Fittings

A. Gallenkamp & Co. Ltd, Sun Street, London, E.C.2., have just published a new 60-page catalogue of laboratory furniture and fittings. This provides a comprehensive guide to modern laboratory requirements and incorporates many of the latest design trends in metal and timber furniture.

New Spang Plastic Coating

A new *Spang* plastic coating for minimizing paraffin deposition in tubing and casing, is announced by the National Supply Company, Pittsburgh.

A new *Red* coating is the same tough, epoxy-phenolic plastic as the thoroughly-proven *Green* coating that has been used on *Spang* plastic-coated tubing for a number of years, but is approximately half as thick as the *Green*. Nine standard sizes of *Spang Red* plastic-coated tubing and casing, ranging from 2⅜ to 7 inches.

Cardwell Rigs to be Made in Kent

Le Grand Rochester Ltd announces that it has completed an agreement with Cardwell Manufacturing Company, U.S.A., to manufacture at Rochester, their range of drilling, servicing, and workover rigs. It is anticipated that Le Grand will be in a position to commence delivery before mid-1959.

The Cardwell range of servicing and workover rigs covers models for operating from 5000-ft to 15,000-ft, and drawworks capable of drilling to 10,000-ft with 4½-inch drill pipe. Initially, to ensure early delivery, some components will be imported from the U.S.A.

Marine Cathodic Protection

MAPEL have had a record year for installing their system of finned magnesium anodes in some of the latest tankers launched during the past 12 months. These include, *British Duchess*—42,000 dwt, BP Tanker Co. Ltd, the largest British-owned tanker; *Esso Durham* 36,000 dwt, one of the largest Esso tankers; *Nordic Hawk*—34,500 dwt, largest Danish tanker; *Nanny*—34,000 dwt, largest Swedish tanker; and the *Irish Hawthorn*—18,000 dwt, the biggest merchant ship in the Eire merchant fleet.

Electronic Strip-Chart Recorder

George Kent Ltd announce the addition of the *Mark* 3 *Multelec* high-speed electronic strip-chart indicator-recorder (hitherto confined to nuclear-energy and other special applications) to their general industrial range of instrumentation and control. The *Mark* 3 is at present available for the precision measurement of millivoltage, and of temperature, in association with thermocouple, resistance thermometer, or radiation pyrometer.

New Fuel Oil Additive

A fuel oil additive that helps eliminate and prevent formation of burner-clogging sludge has been announced by the Du Pont Company.

Du Pont Fuel Oil Additive No. 2 (*FOA*-2), it is claimed, might save as much as $40 for each dollar invested in the additive in the case of industrial plants using large amounts of residual fuel from their own storage tanks. *FOA*-2, which is said to "break up" sludge into fine burnable particles, is usable in all types of fuel oils, including blends.

Further information can be obtained from Frank R. Zumbro, Du Pont Information Service, Public Relations Department, Wilmington 98, Delaware, U.S.A.

"Multi-Purpose" Oil for Tractors

Tractor Oils Universal, the Shell-Mex and B.P. multi-engine oils for farm tractors, are now to be marketed as multi-purpose oils.

The oils will be sold for use not only in tractor engines but for transmission and hydraulics, for the steering box, for power take-off, and belt-pulley—in short, for the entire tractor.

Shell-Mex and B.P. are also marketing a new "multi-purpose" tractor grease ideally suited for the lubrication of all greasing points on wheeled tractors and other farm machinery.

Liquid or Gaseous Nitrogen Plants

A range of small, compact, and completely self-contained plants for the supply of liquid or gaseous nitrogen, has been developed by Refinery Equipment & Speciality Co. Ltd, Valley Works, Monton Road, Eccles, Lancs, to the design of H. E. Charlton Engineers Ltd. Five models are available which between them cover capacities from 1·5 to 24 litres hr of liquid nitrogen or 2 to 30 standard cubic metres (70 to 1000 s. cu. ft.) of gaseous nitrogen her hour.

Prevention of Tank Overfill

R. F. Landon & Partners Ltd, David Road, Poyle Trading Estate, Colnbrook, Bucks, are now marketing the *Kingsway* Filguard. This is a device which is intended to ensure that oil storage tanks are not overfilled. A float and lever system operates a switch on the top of the tank, and at the fill point an audible and visible warning device is operated.

Giant Swamp Tractor for Oil Search

A giant amphibious crawler tractor is shortly to be shipped from the U.K. as a new move to speed the search for oil in Nigeria. Ordered by The Shell-BP Petroleum Development Company of Nigeria Ltd from Albion Motors Ltd, this machine, known as the Albion-Cuthbertson *Water Buffalo*, is designed to transport heavy drilling equipment and materials into the heart of the Niger Delta swamp lands.

Operations in this part of the Company's oil prospecting licenses will have to be carried out in areas which include some of the worst terrain in the world from the oil-man's point of view. The tractor, which will haul partially dismantled heavy drilling equipment and fabricated steel platforms—the latter to form a firm base in the swamps for the drilling rig itself — will penetrate areas impassable to vehicles a fraction of its weight. It has a tread far lighter than a man, exerting a ground pressure of 1½–2 psi as against the 6·5 psi exerted by a man.

The *Water Buffalo* will be shipped with two amphibious slipes, or trailers; a 28-tonner, and a 10-tonner. It will haul the 10-ton slipe laden with smaller equipment, tools, and reels of cable, which will be "run-out" to form a ropeway across the swamps to help the tractor negotiate the worst surfaces when hauling the larger slipe laden with 28 tons of machinery.

A powerful capstan winch, mounted on the front of the deck of the machine, will pick up the cable and haul the amphibious train over the most difficult stretches. The speed of the vehicle's tracks is always synchronized with that of the winch, giving maximum tractive effort. The flat top deck of the vehicle will also be equipped at the front with a bulldozer blade operated hydraulically, an "A" frame at the rear for use as a crane, and an oilfield-type winch with a line pull of 70,000 lb.

The tractor is also fitted with an extension to the body sides to make it amphibious, for use in deep water. This extension is readily removable when it is not required. The slipe trailers also have sufficient freeboard to enable them to float fully-laden in deep water.

Molybdenum Disulphide Lubricants

At a recent press conference in London, G. J. Vineall, director of research to Rocol Ltd, explained the developments which led his Company to adopt molybdenum disulphide as an additive for their new *Molyspeed* lubricants. Initially such oil had been developed industrially and for the last seven or eight years had been marketed for all types of plant, including the Calder Hall reactor.

Attention had also been paid to motor oil and, following laboratory tests, road tests over distances of 36,000 and 40,000 miles were made.

Mr Vineall then introduced Geoffrey Innes, who had just arrived in London after a 10,000 mile journey from Southern Rhodesia. Throughout the journey, which some excellent colour slides showed to be over extremely rough roads for considerable distances, he had used *Molyspeed* motor oil with satisfaction.

Valve Motorization

The system devised by Rotork Engineering Co. Ltd, of Bath, for the opening and closing of pipeline valves involves the direct application of electrical power to the valve. The actuators are made in various forms to meet the requirements of any type or size of valve, and may be controlled from any suitable switching device. The Rotork Actuator incorporates a specially-designed electric motor with characteristics chosen to suit particular requirements of valve operation.

Goodyear Process Pumping Set

A new compact light-weight pumping unit is announced by Goodyear Pumps Ltd, Camborne, Cornwall. It is specially designed for food and chemical processing applications, factory and laboratory installations, and it is also suitable for general pumping duties.

To a Goodyear Size A5 positive displacement pump is coupled a Newman *Elf* ¾ hp AC electric motor mounted on a special light-weight aluminium bedplate casting. The pump is completely self-priming and can run with a dry suction for long periods making it ideal for emptying vats and barrels completely. It is also capable of handling viscous fluids and fluids which contain suspended solids.

Stanlow—Partington Pipeline

Supervision of welding, and inspection of the coating on the multiple pipelines which are to be built for Shell Refining Company Ltd along the twenty-three mile Stanlow—Partington route, are to be carried out by Welding Supervision Ltd. The latter company is at present inspecting the pipes and supervising the coating operations prior to stringing. Some pipes which are received already wrapped will also be inspected for imperfections of the coating.

It is estimated that some 138 miles of pipeline, varying in diameter from four inches to eight inches, will be involved.

1100 Series Computer

With the increasing complexity of contemporary engineering problems more computing equipment is called for to simulate many different systems.

This entails greater chances of operating errors, further time-wasting effort, and prohibitive costs. To reduce this cost, both in terms of money and engineer man-hours the Berkeley (California) Division of Beckman Instruments Inc. has designed its EASE 1100 Series Computer. The new machine incorporates several new techniques and enables the technician to handle a large part of the work formerly done by the engineer.

Hilger and Watts Catalogues

Two catalogues just issued describe direct-reading spectrographs in *Spectrochemical Analysis*, and *Digitizers and other Equipment for Data Processing*. The first describes the operation of three-metre grating polychromators, medium direct-readers, and fluorite polychromators, together with results of direct-reading analysis, and the application of a metal ratio analyser. The latter catalogue lists the various equipment available on the subject of data processing.

Further information can be obtained from Hilger & Watts Ltd, 98 St Pancras Way, London, N.W.1.

Coseley Buildings

Two new illustrated brochures have been produced by Coseley Buildings Ltd, Lanesfield, Wolverhampton. The first describes the Company's expanded range of steel frame buildings of all types, and is entitled *Coseley Buildings*. The second covers Coseley's Kingstrand frameless aluminium buildings, which are packaged units supplied with all the tools required for erection.

★ ★ ★

SITUATIONS VACANT

Department of Scientific and Industrial Research: Geophysicist. Pensionable post to be graded as Geologist of Senior Geologist in Geological Survey and Museum, London, for man at least 21 on 1.7.59. Candidates should normally have (or obtain in 1959) 1st or 2nd Class honours degree in Geology, Geophysics, Physics, or Mathematics, together with a university qualification to at least first year standard in Geology and in Physics or Mathematics, or an equivalent qualification. Experience in Applied Geophysics an advantage. At least 3 years post graduate or other approved experience necessary for appointment as Senior Geologist. Duties are concerned with geophysical surveys in the field. London salary within the scales £655-£1150 (Geologist) or £1230-£1460 (Senior Geologist), according to age, qualifications, and experience. Provision for starting pay above minima. Promotion prospects. Write Civil Service Commission, 17 North Audley Street, London, W.1 quoting S4952 59. Closing date 14 April 1959.

Mechanical Engineer required in Middle East for Technical Sales of oilfield equipment. Should have had oilfield experience, preferably on drilling or rig maintenance. Must be prepared to travel. Good salary and conditions. Write giving full details to Box No. 1125, *IP Review*.

FOR SALE

Waterfog and Waterspray Installations, automatic or non-automatic, designed and installed for Fire Fighting. Also complete Foam Installations. Fire Armour Limited, 9 George Street, London, W.1.

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Forthcoming Meetings

THE INSTITUTE

(*At* 61 *New Cavendish Street, London, W.*1., 5.30 *p.m.—tea* 5 *p.m.*)

Submarine Exploration for Oil. A Symposium by members of BP Exploration Co. Ltd **6 May**

IP Economics and Operations Group

(*At* 61 *New Cavendish Street, London, W.*1., 5.30 *p.m.—tea* 5 *p.m.*)

A Review of the Year 1958. Dr P. H. Frankel **9 April**

IP ESSEX BRANCH

(*At Railway Hotel, Pitsea*, 7.30 *p.m.*)

Gasoline and Gasoline Engines. C. L. Goodacre, M.S.A.E., A.R.Ae.S. **15 April**

IP FAWLEY BRANCH

(*At Esso (Fawley) Recreation Club, Holbury*, 7.30 *p.m.*)

The Uses of Plastics. G. Hulse. **15 April**

IP LONDON BRANCH

(*At* 61 *New Cavendish Street, London, W.*1. *at* 6 *p.m.—tea* 5.30 *p.m.*)

Oil in the Gas Industry. Dr J. Burns, G.M., B.Sc., F.Inst.F., M.I.G.E. **21 April**

IP NORTHERN BRANCH

(*At Engineers' Club, Albert Square, Manchester* 2, 6.30 *p.m.*)

Joint Meeting with the N.W. Branch of the Institution of Chemical Engineers. Dr C. G. Williams **21 April**

IP SOUTH EASTERN BRANCH

(*At King's Head Hotel, Rochester*, 7.45 *p.m.*)

The Manufacture and Uses of Carbon Black. D. L. Allan **7 April**

IP STANLOW BRANCH

(*At Blossoms Hotel, Chester*, 7.30 *p.m.*)

High Vacuum Techniques in Chemical Engineering. A. S. D. Barrett **15 April**

IP YORKSHIRE BRANCH

(*At Metropole Hotel, Leeds*, 7 *p.m.*)

Textile Oils with Special Reference to Mineral Oils. R. C. Hartley, A.R.I.C. **9 April**

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WEST'S PILING at the Isle of Grain

17½ in. diam. and 20 in. diam. West's Reinforced Concrete Tubular Shell Piles, varying in length from 11 to 68 feet, support refinery units and storage tanks on the Expansion Project at the Kent Oil Refinery of the British Petroleum Company Ltd at the Isle of Grain.

This modern, mobile system of piling, which combines a precast outer shell with a cast-in-situ core, has been successfully used for all types of structure, including (in addition to petroleum installations) steelworks, factories, gas and electricity works, bridges, flats and houses.

Piling and tank foundation construction in progress for B.P. Refinery (Kent) Ltd on the Isle of Grain.
(Photographs by courtesy of the British Petroleum Company Ltd)

"Foundation Engineering," our latest publication, explains the system in detail. Please write for a copy mentioning this announcement.

WEST'S *SHELL* PILING SYSTEM

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Southern Africa: The Roberts Construction Co. Ltd, Johannesburg
France: Compagnie Générale de Construction de Fours, Paris
Ireland: Farrans Ltd, Dunmurry, Belfast

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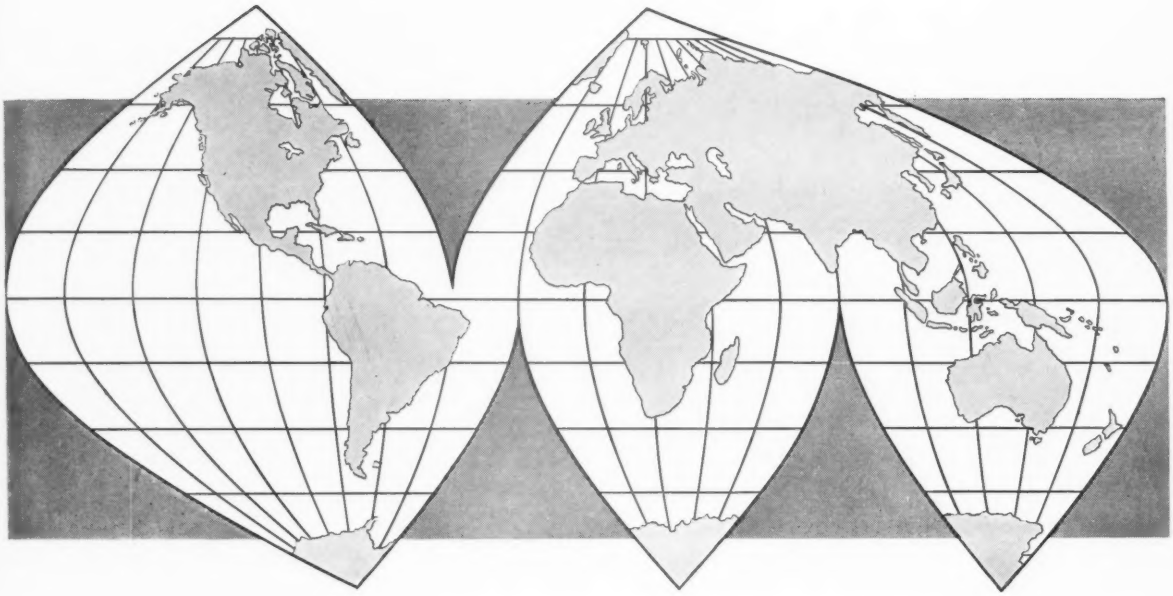

The need for new and better telecommunications systems throughout the world becomes more apparent every day. The General Electric Company continues to make a substantial contribution to this development.

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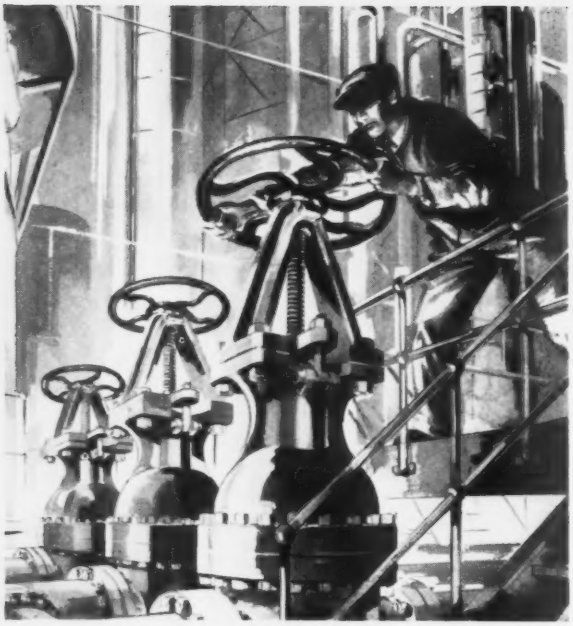
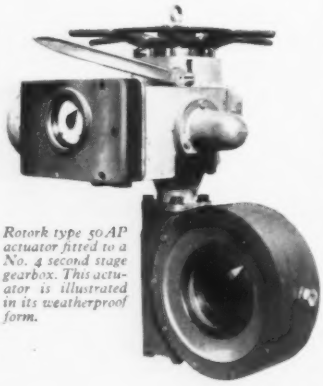


This man is a weak link

The efficient operation of extensive plant too often depends on the speed, strength and infallibility of the valve operator. One mistake and he could jeopardize production: he may even place plant and lives in danger.

By motorising valves with Rotork actuators, these possibilities can be eliminated. Any size or type of valve can be fitted with a Rotork actuator: response is immediate to a signal from push-button or automatic switch: any number of valves can be operated simultaneously: an arrangement of valves can be sequence-interlocked to ensure foolproof operation: centralized control of widely separated valves can be arranged from one convenient point.



Rotork type 50AP actuator fitted to a No. 4 second stage gearbox. This actuator is illustrated in its weatherproof form.

Our catalogue contains extensive information about valve control. May we send you a copy?

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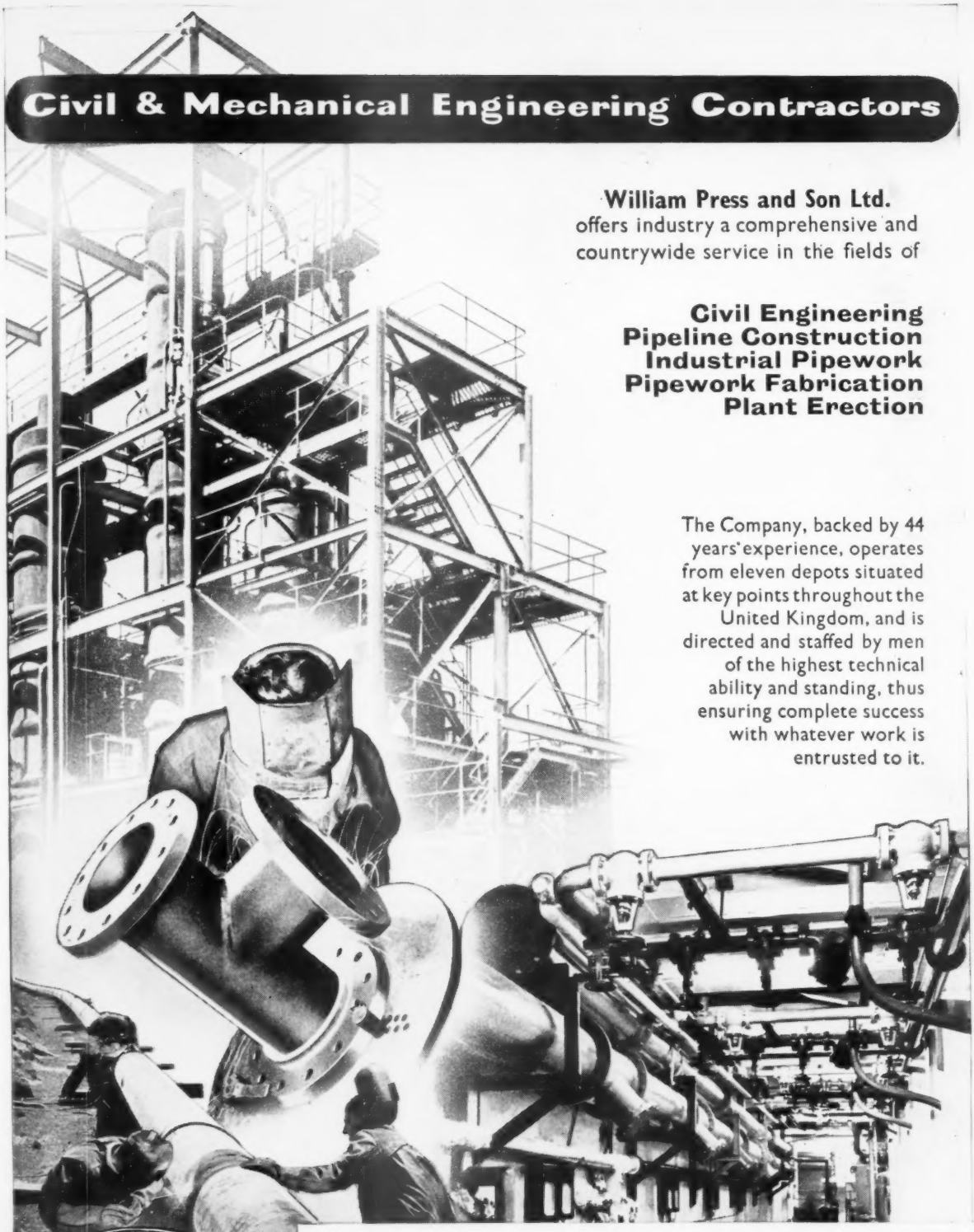

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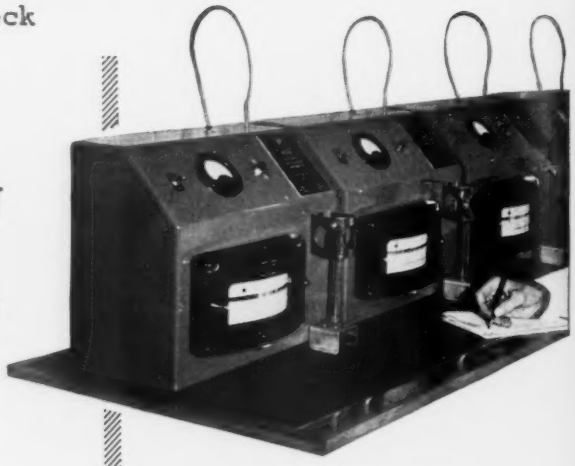

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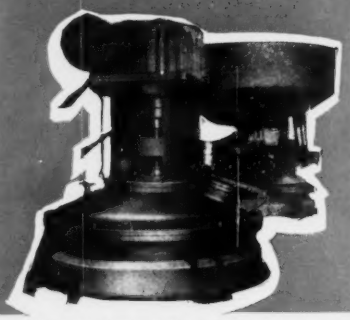
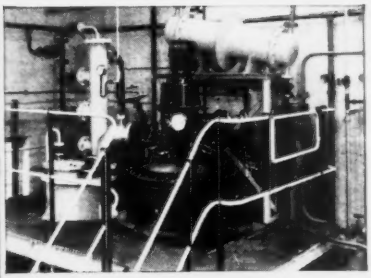
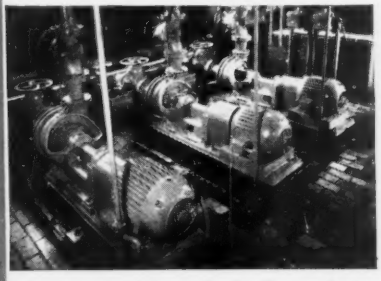


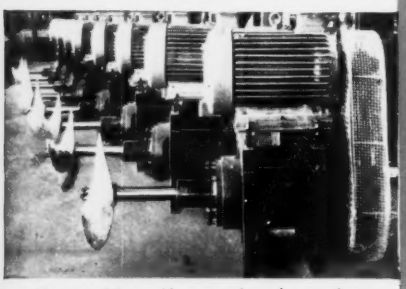
Large kettle installed in a grease plant.



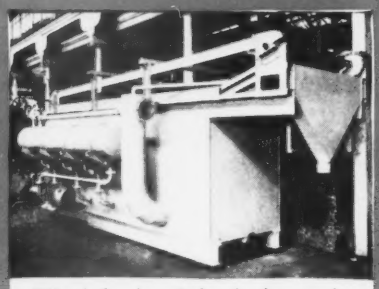
Resin making plant with electric induction heating.



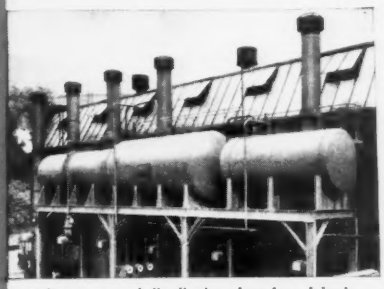
Battery of Mitchell centrifugal acid pumps in a rayon factory.



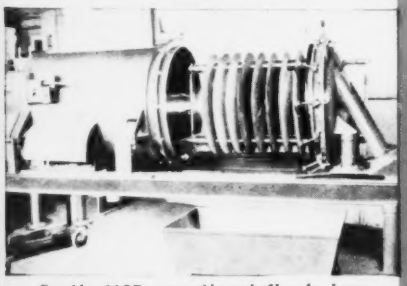
Battery of large side-entry mixers for petroleum blending.



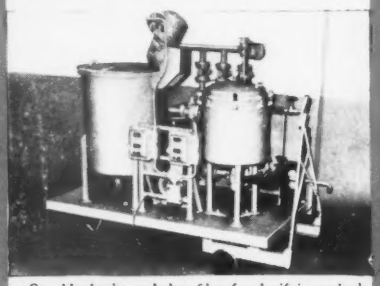
Gibbs air flotation cell plant for the removal or recovery of greasy residues.



Bulk storage and distribution plant for sulphuric, hydrochloric and nitric acids in the Steel industry.

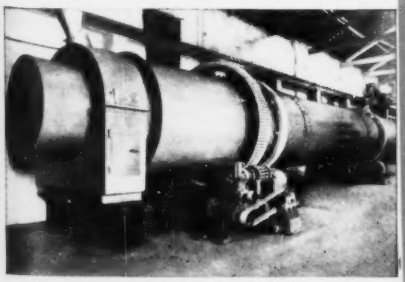


Sparkler MCR retractable tank filter for heavy duty filtration.



Sparkler horizontal plate filter for clarifying resins.

Kettle and autoclave for grease manufacture.



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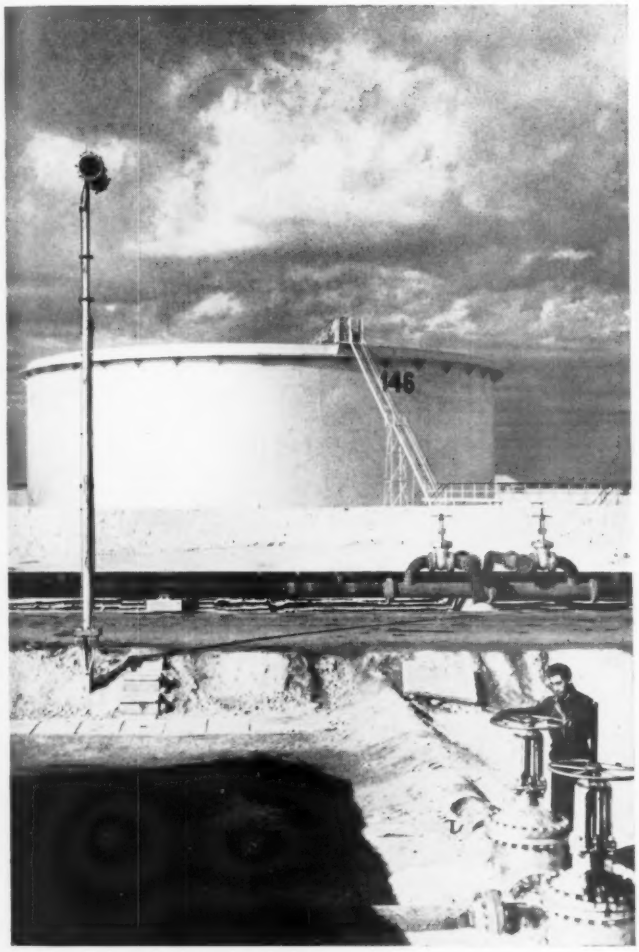

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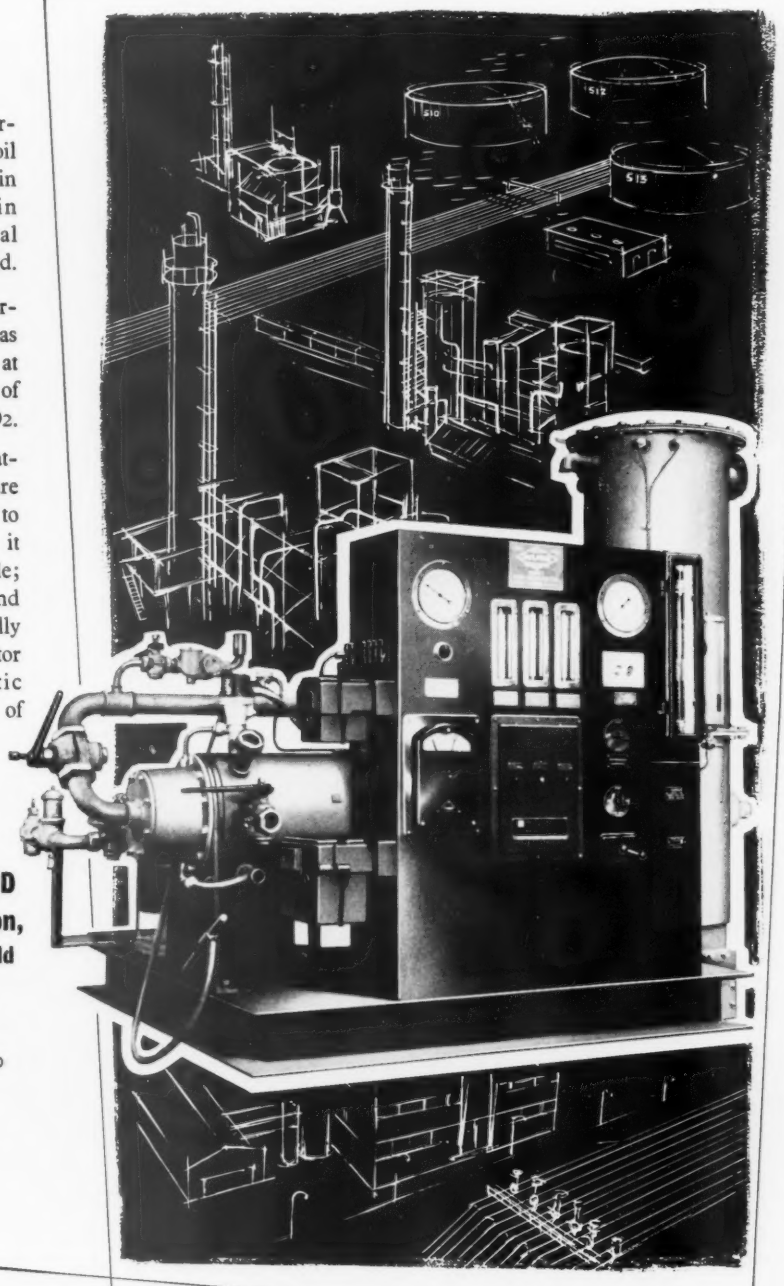

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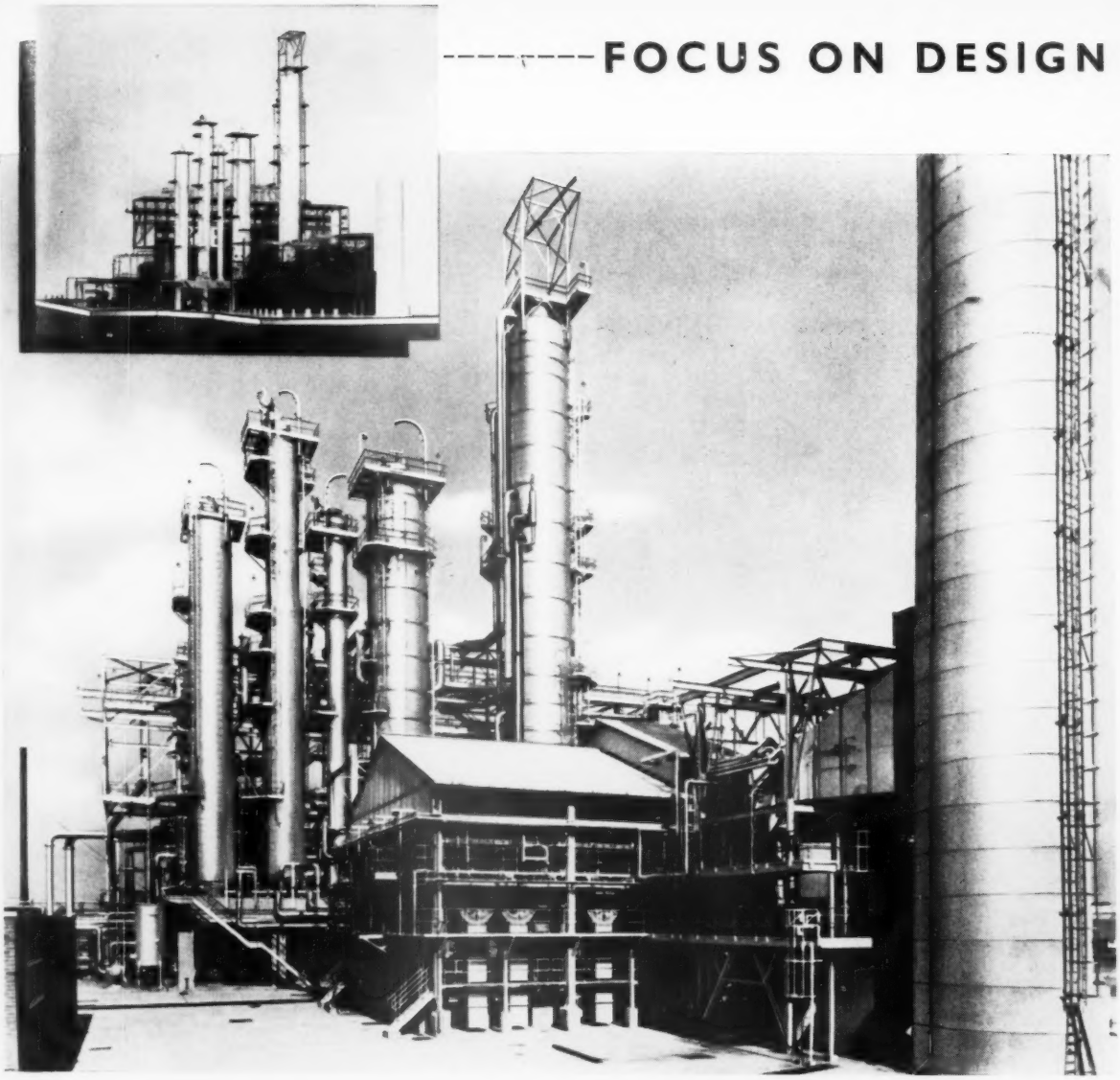

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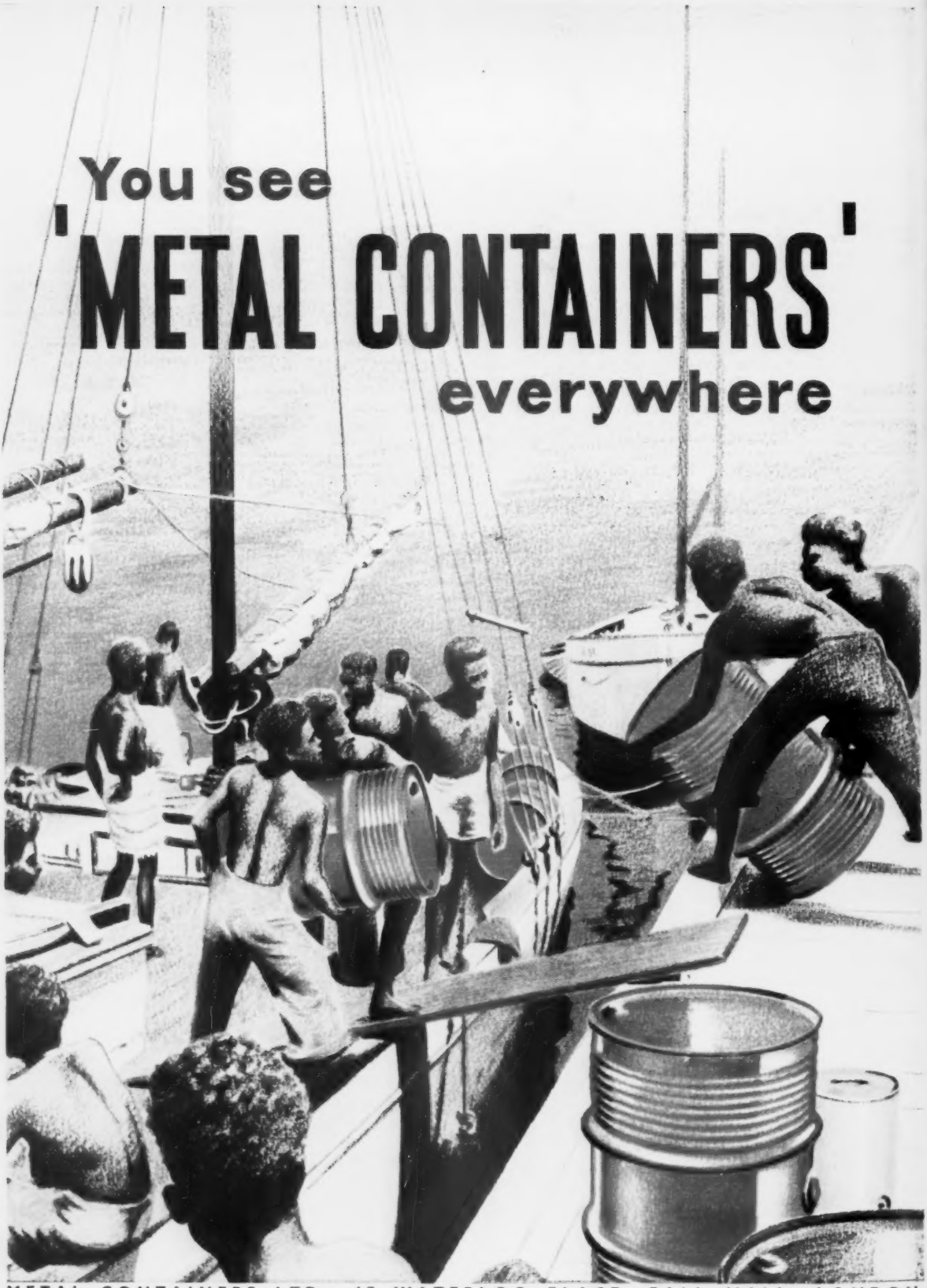

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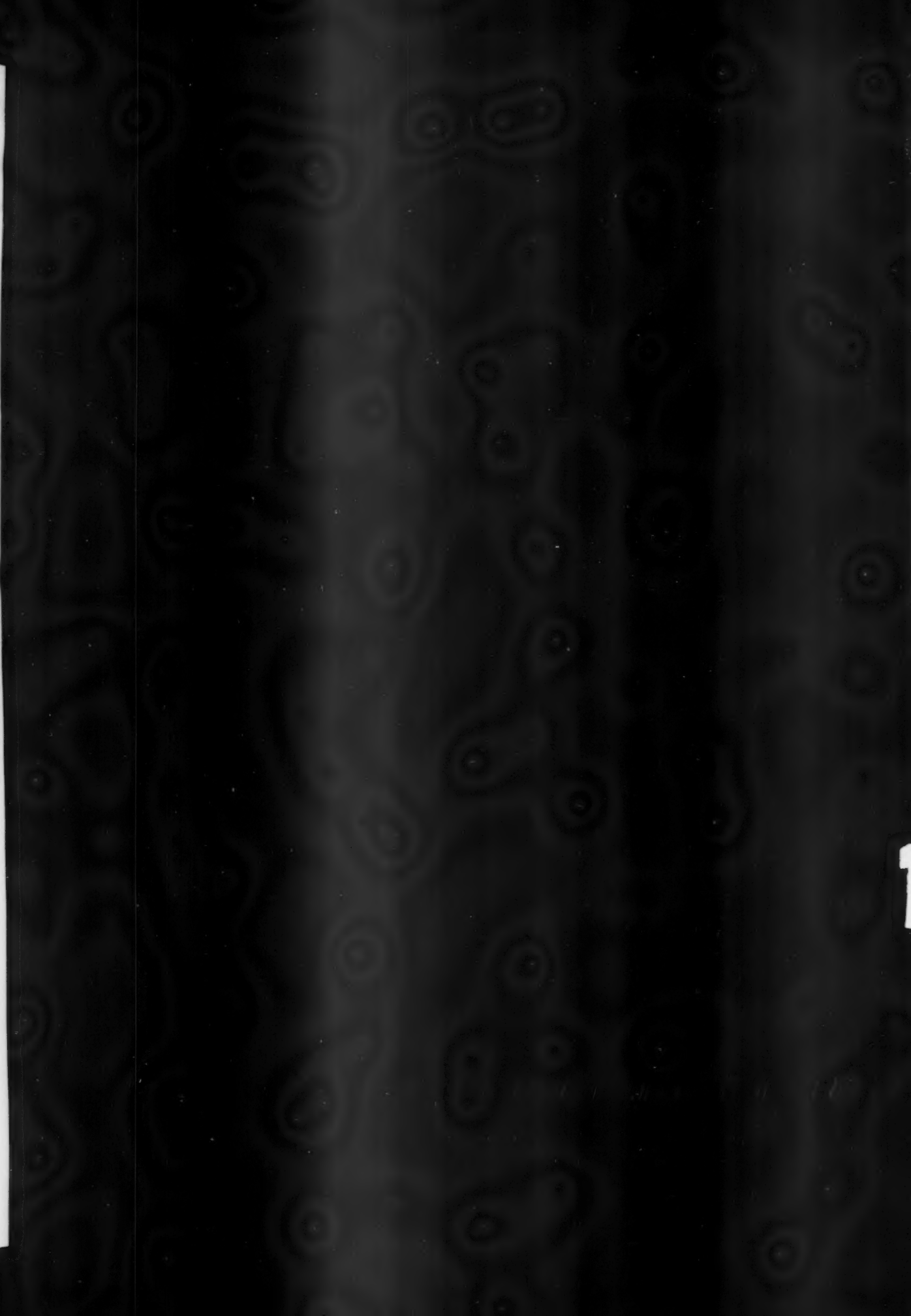
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